# source\detectedissue\detectedissue-examples-header.xml

# source\detectedissue\detectedissue-introduction.xml

## Scope and Usage

This resource applies to various circumstances where there is a concern about an existing or proposed set of clinical activity. The issue could relate to single, proposed, or multiple actions. It does not apply to technical issues (e.g. lack of user permissions) but could relate to violation of patient consent limitations. Examples include:

* Drug-drug interactions
* Inappropriate therapy (wrong dose, frequency, body site)
* Duplicate therapy

This resource represents a specific instance of a potential issue for a particular patient. It is **not** intended to represent general patient-independent knowledge. This resource is also **not** intended to be used in defining general prohibitions on actions such as "No NSAIDs", "No solid oral dose forms" or "No MRIs - metalic tatoos". These guidelines can be captured using the [AllergyIntolerance](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\allergyintolerance.html), and/or [Flag](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\flag.html) resources. Similarly this resource is not to be used to capture clinical facts that may imply contraindications such as pregnancy, breast feeding, patient preferences, past procedures, etc. These would be represented using [Condition](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\condition.html), [Procedure](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\procedure.html) or other resources.

## Boundaries and Relationships

This resource only applies to documenting a risk associated with a specific planned or ongoing action, not a general propensity to risk. The latter would be handled using [AllergyIntolerance](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\allergyintolerance.html) for substance-specific issues or [Flag](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\flag.html) for other types of issues.

This resource is limited to clinical issues associated with a proposed or ongoing action. It does not cover technical issues such as lack of permission, duplicate identifiers and other business rule violations. Technical issues are conveyed using the [OperationOutcome](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\operationoutcome.html) resource. It is possible to have both [OperationOutcome](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\operationoutcome.html) and DetectedIssue together, where the OperationOutcome might indicate that a requested action was rejected due to a clinical issue and the DetectedIssue provides the details of the issue.

## Background and Context

Detected issues are typically identified by decision support systems. However, they may also be captured directly by clinicians. The latter typically happens for one of two reasons:

1. A clinician wishes to communicate an issue to another clinician whose responsibility would be to resolve it (e.g. a pharmacist identifying an issue with a prescription prior to putting it on hold)
2. A clinician wishes to pre-emptively identify that an issue is known and is being managed (to avoid red flags being raised as part of downstream workflow). E.g. Submitting a new order and including a link to a "duplicate therapy" issue with mitigation indicating that the therapy is not considered to be duplicate.

Decision-support generated issues can result from calling a decision-support engine directly (e.g. via a custom [OperationDefinition](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\operationdefinition.html)) or as part of an attempt to perform some other function (creating an order, submitting an insurance claim, capturing a medication list). When the issues are generated as a byproduct of performing some other sort of action, they may be included in the "response" to the requested action in the same manner as an [OperationOutcome](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\operationoutcome.html). In fact, both may be present - the [OperationOutcome](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\operationoutcome.html) indicating that there was a warning or error associated with the request and a **DetectedIssue** providing the clinical details. (The [OperationOutcome](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\operationoutcome.html) could point to the **DetectedIssue** via an extension.)

In those circumstances where requested operations are rejected as a result of a detected issue, the workflow may support allowing the operation to be re-tried, provided that the identified issue is included as part of the submission (possibly also including a mitigation). In doing so, the sender acknowledges the issue and takes responsibility for it, thus allowing the requested operation to proceed. See [Linking to Detected Issues](#linking) for guidance on how a **DetectedIssue** instance might be included as part of another operation.

Systems that require such workflows should document expected behavior as part of their [Conformance](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\conformance.html) declarations.

# source\detectedissue\detectedissue-notes.xml

## Linking to Detected Issues

DetectedIssue follows the pattern of linking from the resource created "second". As DetectedIssue originates in response to one or more other existing records, it points to those records rather than being pointed to from them.

In some cases, a detected issue might be associated with a single record. When this occurs, it may be stored as a contained resource within the implicated resource provided that there is no expected need to search for the detected issue directly. However, with detected issues that implicate multiple records, containment is more problematic. In some workflows, a detected issue might be deemed to be "owned" by the record whose creation triggers the contraindication being created - i.e. the "second" or "last" record. However, where multiple actions are proposed as part of a single submission, there can be no single owner and containment will not be feasible.

If there is a strong need to point from an implicated resource to DetectedIssue and containment is not appropriate, an extension can be used.

## Workflow Challenges

DetectedIssue is a resource that is frequently associated with workflow challenges where frequent alerts that are not clinically relevant result in clinicians tuning out (or turning off) the content and thus missing relevant alerts. Give consideration to this issue before making heavy use of this resource.

## Open Issues

* Are author, reference and/or mitigation (and its various parts) all part of the 80%?

# source\basic\basic-examples-header.xml

# source\basic\basic-introduction.xml

## Scope and Usage

**Basic** is a special type of resource. Unlike all other resources, it doesn't correspond to a specific pre-defined HL7 concept. Instead, it's a placeholder for any resource-like concept that isn't already defined in the HL7 specification.

The Basic resource is intended for use in three circumstances:

1. When an implementer needs a resource concept that is likely to be defined by HL7 in the future but they have not yet done so (due to bandwidth issues, lack of sufficient requirements, lower prioritization, etc.)
2. When there's a need to convey a narrative-only construct that doesn't neatly correspond to one of the other resources, either because it combines aspects of several resources (e.g. Assessment + Plan) or because the allowed content is flexible such that the system can't be totally sure what sort of content might have been included in the narrative text.
3. Other than the circumstances above, this resource will see minimal use. To keep the FHIR specification manageable, it cannot incorporate every site-specific requirement that might be needed in some implementation somewhere. This set of resources likely won't ever be officially defined in HL7.

There's also a fourth circumstance: An implementer wishes to convey information that could/should be conveyed using a standard resource, however they want to represent the information in a custom format that isn't aligned with the official resource's elements. While this resource would be the preferred way of meeting that use-case because it will at least be wire-format compatible, such a use would not be conformant because making use of the Basic resource would prevent the healthcare-related information from being safely processed, queried and analyzed by other conformant systems.

Implementers don't need to be concerned with which of the three categories their desired resource fits within. If they need a resource and it clearly doesn't fit one of the ones currently defined, they should use Basic.

## Background and Context

Basic defines only a minimal set of data elements - those necessary to identify what kind of resource it represents and those necessary to support resource [compartmenting](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\compartments.html#compartments). All other data elements are represented using the [extension](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\extensibility.html) mechanism. It's entirely possible to have a Basic resource instance with nothing other than narrative, a subject and code. And, in practice, that's all many systems will understand.

# source\basic\basic-notes.xml

## Why not custom resources?

Technically, nothing prevents implementers from going off and defining their own resources containing whatever data elements they wish. However, doing so causes several issues:

* Custom resources don't have a discoverability mechanism in the same way custom codes and extensions do using the [ValueSet](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\valueset.html) and [StructureDefinition](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\structuredefinition.html) resources. As a result, any implementer that receives a custom resource would have no way of looking up what the meaning of the resource or its elements were. While they could get some sense of meaning from XML or JSON tag names, this often isn't sufficient for safe healthcare interoperability.
* Custom resource names would not be present in the FHIR schemas as allowed elements within the FHIR Bundle schema, would not be present in the enumeration of resources in the Reference type, and would not be supported by any of the auto-generated reference implementations and software interfaces. This would cause issues for any receiving system making use of the schemas directly or via code-generation.
* There is no means of preventing two implementers from independently coming up with the same name for a resource but defining it differently in terms of meaning as well as allowed elements. This would also cause interoperability issues.

All of these concerns are mitigated when there's an assumption that the custom resource will only be used within a narrow constrained environment where all participants will be aware of the semantics, will be using the same custom schemas and there's no chance of collisions. However, HL7's experience is that closed implementation environments rarely remain that way over the long term. Eventually data will need to be shared with others outside the closed environment and all of the above issues will again come into play.

Therefore, use of 'custom' resources is **NOT** considered to be conformant with FHIR. While the use of extensions may make the Basic resource slightly more complex and less visually appealing, it is the only safe and approved mechanism for sharing resource concepts not representable using standard HL7-defined resources.

It is expected that future versions of the interface tooling will be able to generate object interfaces on the basis of profiles. Where this occurs, the complexity of custom resource elements being expressed as extensions should be transparent to the internal code of systems that support that particular variant of the Basic resource. This should further reduce the cost of using 'Basic' as opposed to custom resources.

NOTE: This position is subject to change based on implementation experience. Alternative mechanisms for handling custom resource requirements in a safe manner may be explored. Ideas around alternative technical strategies for managing this issue are welcome.

## Documents and narrative-only resources

Documents are constructed of sections, where a key part of each section is the narrative. The narratives are stitched together to form the overall text of the document. Many document sections will correspond neatly to resources that are already defined - [List](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\list.html), [DiagnosticReport](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\diagnosticreport.html), [FamilyMemberHistory](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\familymemberhistory.html), etc. However, oddly enough, alignment with FHIR resources isn't always top of mind when clinicians and others design documents and some sections won't neatly align with the boundaries of resources. Sometimes there's simply a need for a place where a document author can say "stuff" without any particular constraints on what they may choose to talk about. Basic is intended to provide a mechanism to handle those circumstances.

Wherever possible, the "standard" FHIR resources should be used, even for narrative-only content. That's because subsequent revisions of the narrative-only content might choose to encode pieces or even all of the narrative content. Encoding can occur with "Basic" as well. Extensions can point to other resources (contained or stand-alone) that fully encode pieces of the free-form narrative found in the Basic resource. If no appropriate other resource exists for the meaning of the content, extensions can also be used.

## Best practices for using 'Basic'

There are several good practices to follow when making use of the Basic resource:

1. Before using Basic, post a description of the desired resource type on HL7's FHIR list-server or on [Stack Overflow](http://stackoverflow.com/questions/tagged/hl7_fhir) to see whether the use-case can be met by an existing resource. (Sometimes the intended scope of an existing resource won't be clear, even if the intent is to cover your space.) Using an existing resource is usually preferable to using Basic as it significantly increases the likelihood of interoperability.
2. If an existing resource would normally be a good fit for your use-case but can't be used due to overly prescriptive constraints your implementation is unable to meet, again raise the problem on [Stack Overflow](http://stackoverflow.com/questions/tagged/hl7_fhir) so the problem with the specification can be addressed.
3. If it is necessary to make use of the Basic resource, try to use one of the HL7-defined codes for resource type or submit your requirement for a new type for inclusion in the HL7 vocabulary (using the [Propose a change](http://gforge.hl7.org/gf/project/fhir/tracker/?action=TrackerItemAdd&tracker_id=677" \t "_blank) link), as this will increase the likelihood of interoperability. Alternate code systems are conformant, but are less likely to be recognized or re-used across the healthcare implementation space.
4. Architect your interface in a way that will make it less painful to swap your use of Basic with an 'official' resource in the event that a future release of FHIR formally defines a resource that encompasses your use-case.
5. Use a [StructureDefinition](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\structuredefinition.html) to define the extensions relevant to each type of other resource used. Profile can also be used to define additional search criteria appropriate for the resource.

## Referencing Basic resources

None of the standard resources will have direct references to Basic, aside from those that allow linking to "Any" resource. As a result, most references to "Basic" will need to be performed using extensions.

# source\binary\binary-examples-header.xml

# source\binary\binary-introduction.xml

## Scope and Usage

There are situations where it is useful or required to handle pure binary content using the same framework as other resources. Typically, this is when the binary content is referred to from other FHIR Resources. Using the same framework means that the existing servers, security arrangements, code libraries etc. can handle additional related content. Typically, Binary resources are used for handling content such as:

* CDA Documents (i.e. with XDS)
* PDF Documents
* Images (the Media resource is preferred for handling images, but not possible when the content is already binary - XDS)

A binary resource can contain any content, whether text, image, pdf, zip archive, etc. These resources are served in their native form on the rest interface, but can also be represented in XML or JSON, such as when including these resources in a bundle (used when it is convenient to include these in the feed directly rather than leaving them by reference).

## Boundaries and Relationships

This resource is generally used as the target of a [Document Reference](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\documentreference.html) or an [Attachment](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\datatypes.html#Attachment), when a FHIR server finds it convenient to manage the content within the same overall REST framework as the other resources.

# source\binary\binary-notes.xml

### Serving Binary Resources using the RESTful API

Binary resources behave slightly differently to all other resources on the RESTful API. Specifically, when a read request is made for the binary resource that doesn't explicitly specify the FHIR content types "application/xml+fhir" or "application/json+fhir", then the content should be returned using the content type stated in the resource. e.g. if the content type in the resource is "application/pdf", then the content should be returned as a PDF directly.

Note that due to the way the web infrastructure works, it is not possible to make blanket rules about the relationship between the "Accept" field in the http request, and the return type, which is why there is no hard rule about this. However the intent is that unless specifically requested, the FHIR XML/JSON representation is not returned.

Note that in the native binary representation, the metadata is not available directly, though some of it is replicated in the HTTP response headers.

### Security Considerations

Binary resources are not constrained, and therefore can be of any content type and encoding. Therefore extra care needs to be taken to validate the content of the Binary resource against malicious or malformed content. For more details see [Security of Narrative](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\security.html#narrative).

# source\bundle\bundle-examples-header.xml

In addition to the examples below, there are other examples of Bundles through the specification:

* [Document](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\document-example-dischargesummary.html)
* [Message Request](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\message-request-link.html)
* [Message Response](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\message-response-link.html)
* [Collection](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\diagnosticreport-examples.html)

# source\bundle\bundle-introduction.xml

## Scope and Usage

One common operation performed with resources is to gather a collection of resources into a single instance with containing context. In FHIR this is referred to as "bundling" the resources together. These resource bundles are useful for a variety of different reasons, including:

* Returning a set of resources that meet some criteria as part of a server operation (see [RESTful Search](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\http.html#search))
* Returning a set of versions of resources as part of the history operation on a server (see [History](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\http.html#history))
* Sending a set of resources as part of a message exchange (see [Messaging](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\messaging.html))
* Grouping a self-contained set of resources to act as an exchangeable and persistable collection with clinical integrity - e.g. a clinical document (see [Documents](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\documents.html))
* Creating/updating/deleting a set of resources on a server as a single operation (including doing so as a single atomic transaction) (see [Transactions](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\http.html#transaction))
* Storing a collection of resources

## Boundaries and Relationships

There are two ways to collect resources together for transport and persistence purposes - [contained resources](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\references.html#contained), and bundles. There is an important difference between the two:

* Contained resources are "in" the container resource - they can only ever be interpreted and/or changed in the context of the container
* A bundle is a collection of resources that have an independent existence - for example, they can also be accessed directly using the [RESTful API](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\http.html)

In addition to these two technical mechanisms, there are three administrative and infrastructure resources which also support grouping of content:

* The [List](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\list.html) resource enumerates a flat collection of resources and provides features for managing the collection. While a particular List instance may represent a "snapshot", from a business process perspective the notion of "List" is dynamic â€“ items are added and removed over time. The list resource references other resources. Lists may be curated and have specific business meaning.
* The [Group](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\group.html) resource defines a group of specific people, animals, devices, etc. by enumerating them, or by describing qualities that group members have. The group resource refers to other resources, possibly implicitly. Groups are intended to be acted upon or observed as a whole. E.g. performing therapy on a group, calculating risk for a group, etc. This resource will commonly be used for public health (e.g. describing an at-risk population), clinical trials (e.g. defining a test subject pool) and similar purposes.
* The [Composition](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\composition.html) resource â€“ defines a set of healthcare-related information that is assembled together into a single logical document that provides a single coherent statement of meaning, establishes its own context and that has clinical attestation with regard to who is making the statement. The composition resource provides the basic structure of a FHIR [document](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\documents.html). The full content of the document is expressed using a bundle. Compositions will often reference Lists as the focus of particular sections.

# source\bundle\bundle-notes.xml

### Notes

* Conceptually, a bundle is a list of resources with some context (named links, and status on the entries)
* Since a Bundle is itself a [Resource](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\resource.html) it has the same common metadata as all resources, including profile assertions, tags, and security labels
* Both Bundle.link and Bundle.entry.link are defined to support providing additional context when bundles are used (e.g. [HATEOAS](http://en.wikipedia.org/wiki/HATEOAS)). Bundle.entry.link corresponds to links found in the HTTP header if the resource in the entry was [read](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\http.html#read) directly. This specification defines some specific uses of Bundle.link for [searching](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\search.html#conformance) and [paging](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\http.html#paging), but no specific uses for Bundle.entry.link, and no defined function in a transaction, meaning is implementation specific

### Using Bundles

The content and rules for using a Bundle depend on the [type](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\bundle-definitions.html#Bundle.type) of the bundle. Note that all bundle types use resource identity resolution as described below.

#### Document

A document bundle (type = "document") consists of a series of entries, the first of which is a [Composition](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\composition.html). Each entry element SHALL contain a resource. See [Documents](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\documents.html) for further information.

[Example](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\document-example-dischargesummary.html)

#### Message

A message bundle (type = "message") consists of a series of entries, the first of which is a [MessageHeader](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\messageheader.html). Each entry element SHALL contain a resource. See [Messaging](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\messaging.html) for further information.

Example [Request](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\message-request-link.html) and [Response](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\message-response-link.html)

#### Search Results

A set of search results (type = "searchset") consists of a series of 0 or more entries. Each entry element SHALL contain a resource. See [Search](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\http.html#search) for further information.

In addition, [Bundle.total](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\bundle-definitions.html#Bundle.total) may be used to return the total number of resources that match the search, and that may be returned by following the "next" [link](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\bundle-definitions.html#Bundle.link).

For each entry, a search set can also contain two specific pieces of search related information:

* [search.mode](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\bundle-definitions.html#Bundle.entry.search.mode): An indication of whether the resource is in the search set because it matched the search criteria, or whether it is included because another resource refers to it (e.g. by the [\_include](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\search.html#include) parameter)
* [search.score](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\bundle-definitions.html#Bundle.entry.search.score): The server's search ranking score for the entry. Servers are not required to return a ranking score, but if they do, 1 is most relevant, and 0 is least relevant. Note: often, search results are sorted by score, but the client may specify a different sort order (see [Search Relevance](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\search.html#score)

[Example](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\bundle-example.html)

#### History

An update history (type = "history") consists of a series of 0 or more entries. Each entry element SHALL contain a transaction element that describes the change that was made, and, if the method is a POST or PUT, a resource that represents the state of the resource at the conclusion of the operation. See [History](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\http.html#history) for further information.

In addition, [Bundle.total](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\bundle-definitions.html#Bundle.total) may be used to return the total number of resources that are included in the update history, and that may be returned by following the "next" [link](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\bundle-definitions.html#Bundle.link).

4

Example to do

#### Transaction

A transaction (type = "transaction") consists of a series of 0 or more entries. Each entry element SHALL contain either a transaction element, or a resource element (or both). See [Transactions](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\http.html#transaction) for further information. Each entry in a transaction has the details of an HTTP operation that informs the system processing the transaction what to do with the entry. If the entry method is a 'PUT' or 'POST', then the entry SHALL contain a resource that becomes the body of the HTTP operation.

If there is no transaction element, then there SHALL be a resource and the server must infer whether this is a create or an update from the resource identity supplied.

[Example](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\bundle-transaction.html)

#### Transaction Response

A transaction response (type = "transaction-response") consists of a series of 0 or more entries, 1 for each entry in the transaction it is in response to. Each entry element SHALL contain a transactionResponse element which indicates the outcome of the HTTP operation that the server performed for the entry.

[Example](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\bundle-response.html)

#### Collection

A collection (type = "collection") consists of a series of 0 or more entries. No particular use with respect to the FHIR specification is associated with this bundle. Each entry element SHALL contain a resource.

[Example](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\diagnosticreport-examples.html)

## Resource URL & Uniqueness rules in a bundle

Each entry in a batch must have a fullUrl which it the identity of the resource in the entry. Note that this is not a versioned reference to the resource, but it's identity. Where a resource is not assigned a persistent identity that can be used in the bundle, a UUID should be used (urn:uuid:...).

In some bundles, a given resource can only appear once:

|  |  |
| --- | --- |
| **Type** | **Rules** |
| document | no duplicates (weird edge cases - change tracking?) |
| message | no duplicates (well, messaging deltas?) |
| transaction | no duplicates allowed |
| transaction-response | no duplicates allowed |
| batch | no duplicates allowed |
| batch-response | no duplicates allowed |
| history | yes, duplicates are allowed |
| searchset | no duplicates allowed |
| collection | yes, duplicates are allowed, though generally would not be a good idea |

### Resolving references in Bundles

The Bundle resource is a packaging construct that has one of more entries that are other kinds of resources. Those resources themselves have references to other resources - e.g. an Observation that refers to a Patient. The referenced resources may also be found in the bundle. For example, the system that constructed the bundle may have included both the observation and the patient. The content of the references between resources doesn't change because of the bundle.

This section documents a method that resolves references correctly within a bundle. Note that this method does not define any new semantics; resolution is based on the way resource identity and resource references work.

Applications reading a bundle should always [look for a resource](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\references.html#bundle-refs) by its identity in the bundle first before trying to access it by its URL.

How to resolve a reference in a bundle:

1. If the reference is not an absolute reference, convert it
   * if the fullUrl is a uri, then (you're stuffed!) What to do in this case?
   * if the fullUrl of the resource that contains the reference is a RESTful one (see the [RESTful URL regex](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\references.html#regex)), extract the [[base]](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\http.html#base), and append the reference to it
   * otherwise, treat the fullUrl as a normal URL, and follow the normal method for [Resolving Relative References to Absolute Form](https://tools.ietf.org/html/rfc2396#section-5.2)
2. Look for an entry with a fullUrl that contains the URL in the reference
   * If no match is found, the resource is not in the bundle, and must be found elsewhere (e.g. if an http: URL, try accessing it directly)
   * If multiple matches are found, it is ambiguous which is correct

If the reference is version specific (either relative or absolute), then remove the version from the URL before matching fullUrl, and then match the version based on Resource.meta.versionId.

Here is an example Bundle the demonstrates these rules:

<Bundle xmlns="http://hl7.org/fhir">

<type value="collection"/>

<!-- A patient that already has an id on a server -->

<entry>

<fullUrl value="http://example.org/fhir/Patient/23"/>

<resource>

<Patient>

<id value="23"/>

</Patient>

</resource>

<entry>

<!-- A patient that doesn't have a persistent home - but it does have

a UUID assigned for this bundle "locally identified" -->

<entry>

<fullUrl value="urn:uuid:04121321-4af5-424c-a0e1-ed3aab1c349d"/>

<resource>

<Patient>

</Patient>

</resource>

<entry>

<!-- a relative resource reference -->

<entry>

<fullUrl value="http://example.org/fhir/Observation/123"/>

<resource>

<Observation>

<id value="123"/>

<subject>

<!-- this is reference to the resource above -->

<reference value="Patient/1"/>

</subject>

</Organization>

</resource>

<entry>

<!-- an absolute reference -->

<entry>

<fullUrl value="http://example.org/fhir/Observation/123"/>

<resource>

<Observation>

<id value="123"/>

<subject>

<!-- this is reference to the resource above -->

<reference value="http://example.org/fhir/Patient/1"/>

</subject>

</Organization>

</resource>

<entry>

<!-- reference to a locally identified resource -->

<entry>

<fullUrl value="http://example.org/fhir/Observation/12"/>

<resource>

<Observation>

<id value="12"/>

<subject>

<!-- reference to the patient immediately above -->

<reference value="urn:uuid:04121321-4af5-424c-a0e1-ed3aab1c349d"/>

</subject>

</Observation>

</resource>

<entry>

<!-- reference that doesn't resolve in this bundle -->

<entry>

<fullUrl value="http://example.org/fhir/Observation/12"/>

<resource>

<Observation>

<id value="12"/>

<subject>

<!-- reference to a patient not found in this bundle -->

<reference value="http://example.org/fhir-2/Patient/1"/>

</subject>

</Observation>

</resource>

<entry>

</Bundle>

# source\conformance\conformance-examples-header.xml

# source\conformance\conformance-introduction.xml

## Scope and Usage

The Conformance Statement is a key part of the cverall conformance framework in FHIR. It is used as a statement of the features of actual software, or of a set of rules for an application to conform to. This statement connects to all the detailed statements of functionality, such as [StructureDefinitions](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\structuredefinition.html) and [ValueSets](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\valueset.html). This composite statement of application functionality is used as either the source or target of a conformance assessment. For further information about Conformance testing, see [Conformance Rules](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\conformance-rules.html) and [Profiling FHIR](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\profiling.html).

Specifically, conformance statements are used in one of three ways:

### Describe an actual implementation

In this scenario, the conformance statement describes the capabilities of a deployed and configured solution available at a particular access point or set of access points. The statement describes exactly how to interface with that deployed solution and thus provides for a degree of self-configuration of software solutions.

This is the type of profile that FHIR restful solutions are expected to make available on invocation of the *conformance* operation. It is also the type of statement that forms a basis for the testing, certification or commissioning of specific software installations.

### Describe software solution capabilities

In this scenario, the conformance statement describes generic capabilities of a software application or component solution. The solution might be available for purchase or other acquisition and might be deployed and configured at any number of independent sites. Because it is not dependent on any particular implementation, the profile cannot provide specific details such as endpoint addresses. It may also need to document various configurations in which the application can be set up or describe the degree of customizability associated with the solution.

This type of statement may be used as a marketing tool by software and system developers to formally describe their capabilities. It can also be used as the basis for conformance testing of software solutions independent of a particular installation.

### Describe a desired solution

In this scenario, the conformance statement describes the capabilities of a desired system. It might be used as part of an architectural design process to document needed system capabilities, or might be used as part of an RFP process to formally document the requirements of a requested solution and to document the criteria by which proposals will be evaluated.

These three types of profiles can be used together. A requirements statement can be compared against the solution statements proffered by respondents to an RFP. A solution statement for a software package forms the starting point for the implementation statement associated with a particular installation of that software package.

## Background and Context

Conformance Statements provide for a degree of automatic configuration and adaptation. However, capturing absolutely every variation that could impact the interoperability of two systems, let alone keeping that detailed information up-to-date as systems evolve through maintenance and upgrades is rarely practical. Therefore, conformance statements should be seen as an interim step. They provide a degree of automation. However, they also provide a great deal of human-readable content that can minimize the need for direct communication between the operators of the systems being configured to interoperate.

# source\conformance\conformance-notes.xml

## Notes:

* The Conformance resource provides for an application to describe its use of the RESTful paradigm messaging events, or FHIR documents. Usually, an application would only describe one, but more than one may be described
* RESTful conformance rules:
  + RESTful servers are required to provide [this resource on demand](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\http.html#conformance). Servers SHALL specify what resource types and operations are supported, and SHOULD also specify profiles for each resource type.
  + RESTful clients SHOULD publish a conformance statement
  + The search parameters that a server supports (or a client makes use of) are specified in the resource profile that the conformance statement references
  + Resource Types or operations that are not listed are not supported
* Messaging conformance rules:
  + The interpretation of request and response depends on the mode. If the mode is sender, then request specifies what the application sends, and response specifies what it accepts. If the mode is "receiver", then this is reversed
  + If a request or response is not specified for an event, then no rules are made for it
  + Events that are not listed are not supported
* Document conformance rules:
  + Document Profiles should directly constrain the Document.information.class & type elements so that there is no ambiguity concerning which profile any given document conforms to
* Other service based use of resources: Due to the variability of these services, the *Conformance* resource does not attempt to describe service based use of resources. The various service specifications will need to describe this usage in their own way

### Supporting Profiles

A conformance profile declares two different kinds of profiles for the functionality it describes. For a discussion of the use of these two types of resources, see [two uses for profiles](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\profiling.html).

# source\domainresource\domainresource-introduction.xml

## Scope and Usage

A domain resource is an resource that:

* has a human-readable XHTML representation of the content of the resource (see [Human Narrative in resources](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\narrative.html))
* can contain additional related resources inside the resource (see [Contained Resources](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\references.html#contained))
* can have additional extensions and modifierExtensions as well as the defined data (See [Extensibility](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\extensibility.html))

As an abstract resource, this resource is never created directly; instead, one of its descendent resources ([see List of Resources](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\resourcelist.html)) is created.

## Boundaries and Relationships

This resource extends the base [resource](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\resource.html). All of the listed [Resources](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\resourcelist.html) except [Bundle](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\bundle.html), [Parameters](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\parameters.html) and [Binary](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\binary.html) extend this resource.

# source\domainresource\domainresource-notes.xml

## Search Parameters

This resource doesn't define any common [Search parameters](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\search.html)

To search for extensions, define a search parameter for the extension. All other search parameters are named aliases for existing content in the resource. In some cases, though not all, the search parameter name is the same as the element that it searches, but this is not required. Searching for extensions is the same - define a name that identifies the value extension by its URL, and then searches can filter based on the value of the extension.

# source\group\group-examples-header.xml

# source\group\group-introduction.xml

## Scope and Usage

### Use Cases

The group resource is used in one of two ways:

1. To define a group of specific people, animals, devices, etc. that is being tracked, examined or otherwise referenced as part of healthcare-related activities
2. To define a set of \*possible\* people, animals, devices, etc. that are of interest for some intended future healthcare-related activities

Examples of the former could include group therapy or treatment sessions, exposed entities tracked as part of public health, etc. The latter might be used to define expected subjects for a clinical study.

Both use cases are handled by a single resource because the data elements captured tend to be similar.

## Boundaries and Relationships

There are five mechanisms in FHIR for communicating collections of resources:

* The [List](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\list.html) resource - enumerates a flat collection of resources and provides features for managing the collection. While a particular List instance may represent a "snapshot", from a business process perspective the notion of "List" is dynamic â€“ items are added and removed over time. The list resource references other resources. Lists may be curated and have specific business meaning.
* The Group resource - defines a group of specific people, animals, devices, etc. by enumerating them, or by describing qualities that group members have. The group resource refers to other resources, possibly implicitly. Groups are intended to be acted upon or observed as a whole. E.g. performing therapy on a group, calculating risk for a group, etc. This resource will commonly be used for public health (e.g. describing an at-risk population), clinical trials (e.g. defining a test subject pool) and similar purposes.
* The [Bundle](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\bundle.html) resource - is an infrastructure container for a group of resources. It does not have narrative and is used to group collections of resources for transmission, persistence or processing (e.g. messages, documents, transactions, query responses, etc.) The content of bundles is typically algorithmically determined for a particular exchange or persistence purpose.
* The [Composition](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\composition.html) resource - â€“ defines a set of healthcare-related information that is assembled together into a single logical document that provides a single coherent statement of meaning, establishes its own context and that has clinical attestation with regard to who is making the statement. The composition resource provides the basic structure of a FHIR [document](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\documents.html). The full content of the document is expressed using a bundle. Compositions will often reference Lists as the focus of particular sections.

# source\group\group-notes.xml

# source\list\list-ccda-cognitivestatuses-introduction.xml

## Scope and Usage

This is FHIR Profile is mapped from the Cognitive Status Result Organizer CCDA EntryTemplate : *HL7 Implementation Guide for CDA R2: IHE Health Story Consolidation, DSTU R1.1*, 5.15 Cognitive Status Result Organizer [organizer: templateId 2.16.840.1.113883.10.20.22.4.75 (open)]

This clinical statement identifies a set of cognitive status result observations. It contains information applicable to all of the contained cognitive status result observations. A result organizer may be used to group questions in a Patient Health Questionnaire (PHQ). An appropriate nullFlavor can be used when the organizer/code or organizer/id is unknown.

# source\list\list-examples-header.xml

# source\list\list-introduction.xml

## Scope and Usage

The List resource is a flat, possibly ordered, collection of records. List resources are used in many places, including allergies, medications, alerts, family history, medical history, etc. List resources can be used to support patient-specific clinical lists as well as lists that manage workflows such as tracking patients, managing teaching cases, etc. Resources supported by the List resource can be homogenous â€“ consisting of only one type of resource (e.g. allergy list) as well as heterogeneous â€“ containing a variety of resources (e.g. a problem list including [Conditions](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\condition.html), [AllergyIntolerances](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\allergyintolerance.html), recent [Procedures](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\procedure.html), etc.).

Lists will typically include references to the resources that make up the list, however in some cases the details of the content of the List might be expressed in narrative only, e.g., a text record of a family history. The List resource is only needed if there is a need to filter the set of resources by a mechanism that cannot be accomplished via a simple query. I.e. There is no need to have a List for all [AllergyIntolerances](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\allergyintolerance.html) that exist on a server for a given Patient. However, list is an appropriate mechanism to provide a filtered list of the subset of AllergyIntolerances that are deemed to be "current". Lists are allowed to contain other lists, so that there is a nested collection of lists.

Note that the presence of an item in a List resource SHALL NOT change the meaning of any information that would be understood by looking at the item outside the context of the List, because items may be accessed directly outside the list by RESTful means, or after a document is processed. For example, a List with a code that means "refuted conditions" can not have items that are Condition resources that do not have a [Condition.clinicalStatus](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\condition.html) of [refuted](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\valueset-condition-clinical.html#refuted).

## Boundaries and Relationships

There are five mechanisms in FHIR for communicating collections of resources:

* This List resource - enumerates a flat collection of resources and provides features for managing the collection. While a particular List instance may represent a "snapshot", from a business process perspective the notion of "List" is dynamic â€“ items are added and removed over time. The list resource references other resources. Lists may be curated and have specific business meaning.
* The [Group](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\group.html) resource - defines a group of specific people, animals, devices, etc. by enumerating them, or by describing qualities that group members have. The group resource refers to other resources, possibly implicitly. Groups are intended to be acted upon or observed as a whole, e.g, performing therapy on a group, calculating risk for a group, etc. This resource will commonly be used for public health (e.g. describing an at-risk population), clinical trials (e.g. defining a test subject pool) and similar purposes.
* The [Composition](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\composition.html) resource - â€“ defines a set of healthcare-related information that is assembled together into a single logical document that provides a single coherent statement of meaning, establishes its own context and that has clinical attestation with regard to who is making the statement. The composition resource provides the basic structure of a FHIR [document](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\documents.html). The full content of the document is expressed using a bundle. Compositions will often reference Lists as the focus of particular sections.
* The [Bundle](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\bundle.html) resource - is an infrastructure container for a group of resources. It does not have narrative and is used to group collections of resources for transmission, persistence or processing (e.g. messages, documents, transactions, query responses, etc.) The content of bundles is typically algorithmically determined for a particular exchange or persistence purpose.
* The [DomainResource](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\domainresource.html).contained element allows multiple resources to be nested inside any DomainResource. This is a special type of grouping where the grouped resources lose independent existence - they no longer have their own identifiers, can't easily be queried independently, etc. Use of this grouping is a technical mechanism for managing the independence of resources and has no impact on meaning. Contained, bundles and remotely referenced resources convey the same meaning.

# source\list\list-notes.xml

## List Order

All lists are considered ordered - the order in which items literally appear in the list may be an important part of the meaning of the list. Reordering the items in a list may change the meaning of the list.

While a list always contains an ordered set of items, the significance of the order may be unknown, or it may be insignificant. As an example, consider a list of patients for a practitioner to visit. The list may be in order, where the patients are to be visited in the stated order, or just an unsorted list of patients to be visited in any order.

The list resource has a property orderedBy that, if present, specifies the meaning of the item order. Note, though, that the meaning of the order may be known implicitly rather than specified in the orderedBy element.

Applications SHOULD NOT reorder the elements in a list unless they understand the impact of this on the meaning of the list.

## List Mode & Item Deleted

There are several different kinds of uses for a List resource:

[%codelist http://hl7.org/fhir/ValueSet/list-mode%]

The most common mode is "snapshot", a list that is accurate within the context it is used in but not current or maintained after that, e.g., medications on discharge in a discharge summary. Note that these lists usually have a status of 'current' - they were current when they were prepared. Some kinds of lists may be explicitly retired (particularly if mode = working), but most will not be maintained after creation.

A change list may include deleted items. Some examples of change lists are a reconciled list of allergies, a discharge medication list, and a list with new, updated and deleted items in it, though these may not be lists that include changes (this is an implementation decision). In order to ensure that the list is safe to process, any item where the flag implies that the item has actually been deleted SHALL have the deleted element set to true.

Note that there is no implication about the status of a resource that has been deleted. The only statement that is made is that the resource has been dropped from the list. However applications should ensure that the implication of adding or deleting items from the list is consistent with the logical status of the resource and its contents.

A proper use of List.mode = "changes" with a deleted resource is in a medications list for a discharge summary. See Example "med-list". An improper use would be if the list was a working list of patient medications in a clinical tracking system, and list item flags were used to implement version tracking history within the resource.

## Narrative Content

The narrative portion of the List resource should contain a summary of the items in the list, their key information, along with a human-readable summary of their flags (if present). The narrative may be generated from the data content and/or narrative of the resources referred to in the list, or it may be a narrative written by a human, which is partially or completely matched by structured data in the linked resources. The human written narrative may be the only content if the list has no entries (which would equate to a narrative only section in a document).

An HTML table is the recommended approach, though this is not required. Each List.item should appear in the narrative for the resource, i.e., it SHALL NOT be necessary to retrieve the list items in order to have a human-readable rendering of the content. In addition, if the List.text.status is "generated", then the narrative should not suggest the list contains items for which there are no corresponding List.item elements. If the list has flags, the representation should make clear use of visual hints (borders, lines, bullet marks, etc.) to ensure that human readers do not get confused about which flags belong with which item on space-poor displays (e.g. to prevent wrapping from separating the flags from the items).

Note that when a List resource is used in a [Document](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\documents.html), the narrative of the list is part of the attested content of the document.

In a dynamic environment, the narrative content of the list will be limited to the version of the linked resources at the time the list was last updated. It may be even earlier if the narrative isn't updated to reflect the most recent version of all referenced resources at each update. Best practice for 'working' lists is to update the narrative to reflect the most recent content of all list elements each time the list is revised. Lists should therefore not be relied on as a real-time view of the referenced content. There are a few possible approaches to work around this issue:

* Provide minimal information about the listed resources, possibly limited to only a link. (Not recommended as this severely limits the usefulness of the narrative and is particularly problematic for things like documents where the only attested content might be the List narrative)
* Include only "generated" narrative, so the retriever can easily generate their own "current" view of the list by retrieving the referenced resources, ignoring the fixed narrative.
* The server hosting the list can subscribe to all referenced resources and auto-update the narrative each time one of the referenced resources changes (or at least on a semi-frequent basis)

## Empty Reason

If the list is empty, there could be several different reasons why this is so. For example:

* There are no appropriate entries for the list (i.e. the patient has no known medications/allergies/history)
* The sender (human or system) deemed that these were not related to this context of patient care (usually for privacy related reasons)
* The source system doesn't support these type of entries
* The information to populate the list wasn't gathered - i.e. "Not asked"

Given these possibilities, and the common and significant first case, source systems SHOULD provide an empty reason if the list is empty. Because of the importance of this case, the [special value "nil-known"](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\valueset-special-values.html) should be used when there are no (significant) entries in this context of care. Note that this concept is sometimes described differently, such as "patient denies taking medications", or "patient was unable to identify any relevant medical history".

When receiving a list, systems should not assume that the list is complete (some entries may have been withheld for a variety of reasons), unless there are specific trading partner arrangements in place or, if the list is empty, that there are actually nil known, unless the "nil-known" code is present.

If the list is empty, the narrative should contain text equivalent to the empty reason.

# source\media\media-examples-header.xml

# source\media\media-introduction.xml

## Scope and Usage

The Media resource contains photos, videos, and audio recordings. It is used with media acquired or used as part of the healthcare process. Here are some typical usages:

* Photos of patients and staff for identification purposes
* Photos and videos of diagnostic or care provision procedures for recording purposes
* Storing scans and faxes of paper documents where not enough metadata exists to create a [DocumentReference](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\documentreference.html)
* Images on diagnostic reports

The Media resource may contain medical images in a DICOM format. While such images may also be accessible through an [ImagingStudy](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\imagingstudy.html) resource, the Media resource enables "ready for presentation" access to a specific image. Such images would preferentially be made available in a FHIR ecosystem by the Media.content.url providing a reference to a WADO-RS service to access the image. That WADO-RS service may include rendering the image with annotations and display parameters from an associated DICOM presentation state. Although the Media resource is allowed to contain images collected by a DICOM based system, DICOM images would preferentially be made available in a FHIR ecosystem by provision of a resource with references to a [WADO-RS server](ftp://medical.nema.org/medical/dicom/final/sup161_ft.pdf).

# source\media\media-notes.xml

# source\messageheader\messageheader-examples-header.xml

# source\messageheader\messageheader-introduction.xml

## Scope and Usage

The MessageHeader resource is defined in order to support [Messaging using FHIR resources](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\messaging.html). The principle usage of the MessageHeader resource is when messages are exchanged. However, as a resource that can be used with the RESTful framework, the MessageHeader resource has the normal resource end-point ([base-url]/Message), which is used to manage a set of static messages resources. This could be used to make an archive of past messages available. **Creating or updating Message resources in this fashion does not represent the actual occurrence of any event, nor can it trigger any logic associated with the actual event.** It is just for managing a set of message resources.

# source\messageheader\messageheader-notes.xml

## Notes:

* The resources referenced by the enterer, author and responsible elements may all be included in the message bundle or left out on the basis that the recipient (and any intermediaries) are able to locate/resolve the resources independently. The former would be suitable for loosely coupled systems, and the latter for tightly coupled systems. The messaging conformance statement for an application may reference a [Structure Definition](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\structuredefinition.html) that describes how the bundling occurs
* The actual content of the data resource is specified for each message event (see [the list on the messaging page](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\messaging.html#events)). Any resources referenced in the data element are always included in the bundle
* If *MessageHeader.source.endpoint* and *MessageHeader.destination.endpoint*, are literal URLs, then they SHOULD identify the addresses to which messages can be delivered. If they are logical URIs (i.e. non-dereferenceable), message delivery intermediaries must know how to deliver the message to the destination application.
* The author and the receiver are not the actual technical systems - these are the human or organizations that make use of the technical systems
* A receiver is not obligated to reject messages which do not explicitly identify it as receiver (e.g. a tracker will get messages that are destined for some other system)

# source\namingsystem\namingsystem-examples-header.xml

# source\namingsystem\namingsystem-introduction.xml

## Scope and Usage

Defines a specific code system or identifier system

## Background and Context

For discussion of policy for creating well maintained OIDs and URIs for resources, see [The HL7 WIKI](http://wiki.hl7.org/index.php?title=InM_FHIR_homepage).

# source\namingsystem\namingsystem-notes.xml

### Dealing with duplicate entries

In some cases, the same code or identifier system might accidentally get created more than once in a registry (perhaps because someone failed to check for an existing entry before adding a new one or knows the same concept with a different name. If this occurs, one of the system entries should be deleted and the remaining entry should have its information updated to include any identifiers present on the original entry (and possibly have its descriptive information modified to include additional information gleaned from the duplicate entry).

# source\operationdefinition\operationdefinition-examples-header.xml

# source\operationdefinition\operationdefinition-introduction.xml

## Scope and Usage

The OperationDefinition resource provides a formal computable definition of an [operation](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\operations.html) or [a named query](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\search.html#advanced). The OperationDefinition serves two principal purposes:

* To allow for automatic determination of system compatibility
* To allow for dynamic generation of forms to drive the operations

See below for further information about these, and about how Operations and Named Queries are executed.

## Boundaries and Relationships

Operation Definitions are published to define operations that servers can implement in a common fashion. The FHIR specification itself describes a number (see below), and other organizations, including IHE, national programs, jurisdictions and vendors are able to publish additional operation definitions.

OperationDefinition resources are referred to from two different places:

* From a [Conformance Statement](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\conformance.html), to declare what operations a system does or should implement
* From another OperationDefinition resource. This allows for a server to describe a limited implementation of a standard operation, or to allow traceability if the server has to rename the operation due to a name clash

# source\operationdefinition\operationdefinition-notes.xml

### Operations defined as part of this Specification

### Executing Operations and Named Queries

Operations are executed by POSTing to a URL that is [defined by the operation definition](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\operations.html). Named Queries are executed by performing a [search](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\search.html) with the value of the search parameter "\_query" set to the name provided in the definition.

If the named query is to be performed over the RESTful API, all the parameters must be simple search parameters, so that they can be represented directly in the URL without tricky encoding issues. Named queries always return a bundle containing a set of resources, so all the out parameters must be resources, not data types etc.

### Passing Resources to Operations

There are two ways to pass resources to an operation - directly, or by reference. Since the two forms havevery different behaviors and consequences, the definition of an Operation distinguishes between these two.

As an example, take the [Questionnaire.$populate operation](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\questionnaire-operations.html#populate). This operation takes a questionnaire as a direct parameter. The type of the parameter is defined as 'Questionnaire'. In a parameters resource, it would be represented like this:

<parameter>

<name value="questionnaire"/>

<resource>

<Questionnaire>

<!-- Questionnaire contents -->

</Questionnaire>

</resource>

</parameter>

or, in JSON:

"parameter": [

{

"name": "questionnaire",

"resource": {

"resourceType": "Questionnaire",

// Questionnaire contents

}

}

]

Other parameters are passed by reference. For example, populate takes a set of references to other resources that should be used to pre-populate the questionnaire. These are passed by reference, and the type of the parameter is 'Reference(Any)' - a reference to any kind of resource. In a parameters resource, it would be represented like this:

<parameter>

<name value="content"/>

<valueReference>

<reference value="Patient/123">

</Questionnaire>

</valueReference>

</parameter>

or, in JSON:

"parameter": [

{

"name": "questionnaire",

"valueReference" : {

"reference" : "Patient/123"

}

}

]

Some operations can take either form; in that case, two different parameters must be defined, one for a resource directly, and one for a reference.

### Renaming OperationDefinition.name

It's possible for two different organizations to create different operation definitions that have the same name (or, perhaps more likely, to define equivalent operations that have the same name but incompatible approaches in their parameter lists).

It's also possible, though unlikely, that a server will be required to support both of these operations. Should this be the case, the server is able to do this by giving one of them a new name, and then referring to it by definition in the conformance statement. To illustrate this, let's assume that two different organizations (orgA and orgB) both define an operation called "dothis", and the definitions are incompatible. OrgA publishes its operation definition at http://orga.com/fhir/dothis.xml, and OrgB publishes its operation at http://fhir.orgb.com/meta/OperationDefinition/dothis. The server is able to implement both. Its conformance statement will say:

<Conformance xmlns="http://hl7.org/fhir">

<!-- snip -->

<rest>

<!-- snip -->

<operation>

<name value="dothis"/>

<definition>

<reference value="http://orga.com/fhir/dothis.xml"/>

</definition>

</operation>

<operation>

<name value="dothis2"/>

<definition>

<reference value="http://fhir.orgb.com/meta/OperationDefinition/dothis"/>

</definition>

</operation>

<!-- snip -->

</rest>

<!-- snip -->

</Conformance>

If a general purpose cross server client is looking for the implementation of the http://fhir.orgb.com/meta/OperationDefinition/dothis operation, and wants to be robust against this name clash problem, instead of simply executing the $dothis operation, it can look at the server's conformance statement for the underlying definition URI, and then execute the name given in the conformance statement.

### Determining System Compatibility

A client can determine the compatibility of the server by iterating its conformance statement and seeing whether any of the operations it declares to support source from the same definitions as those the client depends on, and whether the server supports the parameters it uses. A client that does this can report a useful error to the user rather than allowing mystifying operational errors to occur.

Note, however, that there are fundamental limitations to this approach because there are many aspects of these operations that aren't (and can't be) defined in a formal fashion. (For example, co-occurrence constraints amongst parameters.)

In the same sense, a 3rd party tool can examine the conformance statements from a server and a client definition of an acceptable server and confirm whether those two system are would be unable to interoperate.

### Dynamically Generating Forms

Finally, it is possible to generate user interface forms automatically from the operation definitions. The documentation in the form definition and the parameter documentation should be sufficiently useful to allow moderately technical users to guess at the correct content of the form. For this reason, highly technical documentation should go in OperationDefinition.notes.

Note also this is not expected to be a tool of use to typical healthcare end-users; such users will usually need more support than can be offered in a generated form.

# source\operationoutcome\operationoutcome-examples-header.xml

# source\operationoutcome\operationoutcome-introduction.xml

## Scope and Usage

Operation Outcomes are sets of error, warning and information messages that provide detailed information about the outcome of some attempted system operation. They are provided as a direct system response, or component of one, where they provide information about the outcome of the operation.

OperationOutcomes are used in the following circumstances:

* When an [RESTful operation](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\http.html#operations) fails
* As the response on a [validation operation](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\http.html#validate), to provide information about the outcomes
* As part of a message response, usually when the message has not been processed correctly

## Boundaries and Relationships

This resource is not used for reporting clinical or workflow issues associated with a proposed or ongoing action; these would be handled using [DetectedIssue](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\detectedissue.html) or other resources. The resource is not designed to be persisted or referenced from other parts of the workflow.

It is possible to have both OperationOutcome and [DetectedIssue](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\detectedissue.html) together, where the OperationOutcome might indicate that a requested action was rejected due to a clinical issue and the Contraindication provides the details of the issue.

# source\operationoutcome\operationoutcome-notes.xml

## Using Operation Outcome Resources

On the RESTful interface, operation outcome resources are only relevant when a level of computable detail is required that is more granular than that provided by the HTTP response codes. This granularity could include:

* more detail about the location of an issue
* the ability to identify multiple distinct issues
* provision of finer error codes that connect to known business failure states

Operation outcomes returned SHOULD be in alignment with the HTTP response code. For example, if the HTTP code indicates a failure (300+), at least one of the issues should have a severity of "error", indicating the reason for the failure.

## Using the Location Element

Each issue in an operation outcome may have a location reported. Systems that create operation outcomes SHOULD populate the location of an error. A correctly propulated location can allow client systems to:

* Connect return errors with the appropriate UI widget
* Route errors to the corect application or system log
* Develop more intelligent testing applications

In order to support these kinds of usages, this applications need to use the location element consistently. Applications can use the location element to refer to a location inside a resource, or some location in the http request (when appropriate).

### Reporting Errors in Resources

While resources may be represented in XML, JSON, or other forms, error locations are always reported using a simplified XPath notation:

<location value="/f:Patient/f:identifier"/>

The XPath must use the [FHIR standard XPath prefixes f: and h:](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\elementdefinition-definitions.html#ElementDefinition.constraint.xpath) for the FHIR and XHTML namespaces respectively.

The XPath here can be used to automatically find the relevant XML element in a resource if the resource is represented in XML. Because resources are often represented in JSON, and because applications will often process the XPath directly (e.g. to determine the relevant widget), the XPath statement must be simple. Specifically, the XPath SHALL only contain element names and repetition indicators. So this is legal:

<location value="/f:Patient/f:identifier[2]/f:label"/>

but this is not:

<location value="/f:Patient/f:identifier[f:system/@value='http://example.com/mrn']/f:label"/>

Because the Xpath is required to be simple, it can be converted to [JsonPointer](https://tools.ietf.org/html/rfc6901) by dropping the namespace prefixes, and correcting for array offsets. The XPaths above have these equivalent JsonPointer representations:

Patient/identifier

Patient/identifier/2/label

Note that correcting for array offsets may require knowledge of which elements are Arrays in JSON. It is also possible to convert the XPath statements to JsonPath, though there is no single standard for JsonPath.

### Reporting Errors in the HTTP Headers

Servers may also need to report errors in the HTTP headers - especially query parameters when processing searches. Errors are reported using a case sensitive location that has two parts, a fixed "http" and the header or query parameter name separated by a ".". Some examples:

|  |  |
| --- | --- |
| **Location** | **Description** |
| http.name:exact | A reference to the search parameter "name" with the modifier ":exact" |
| http.Authorization | A reference to the Authorization header - perhaps to indicate that it is missing, and some form of authentication is required. |

# source\parameters\parameters-examples-header.xml

# source\parameters\parameters-introduction.xml

## Scope and Usage

This special resource type is used to represent the [operation](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\operations.html) request and response.

## Boundaries and Relationships

This special resource has no other use than for operation parameters, and there is no RESTful end=point associated with it. For further information, see the [operations](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\operations.html) page.

# source\parameters\parameters-notes.xml

Note: for technical compatibility reasons, the *Parameters* resource inherits from [Resource](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\resource.html), but since the parameter exchange format has no end point and/or persistence, it never has an id, a versionId, or a lastUpdated. The other features of Resource (tags, profiles, security labels, language etc) may have use when operations are executed.

# source\resource\resource-introduction.xml

## Scope and Usage

This specification defines a series of different types of resource that can be used to exchange and/or store data in order to solve a wide range of healthcare related problems, both clinical and administrative. In addition, this specification defines several different ways of exchanging the resources.

A resource is an entity that:

* has a known identity (a url) by which it can be addressed
* identifies itself as one of the types of resource defined in this specification
* contains a set of structured data items as described by the definition of the resource type
* has an identified version that changes if the contents of the resource change

Resources have [multiple representations](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\formats.html).

## Boundaries and Relationships

The following optional elements and properties are defined for all resources:

* An identity
* Meta data
* A base language
* A reference to "Implicit Rules"

Most resources are derived from [Domain Resources](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\domainresource.html) - so they also can contain text, contained resources, extensions, and data elements specific to the particular domain of the resource. There is a special type of resource called [Bundle](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\bundle.html) for collections of resources.

Note: there is documentation for the [Structure](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\formats.html), [UML](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\formats.html#uml), [XML](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\xml.html), and [JSON](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\json.html) representations of the resource structure.

# source\resource\resource-notes.xml

### Resource Identity

Each resource has an "id" element which contains the logical identity of the resource assigned by the server responsible for storing it. Resources always have a known identity except for the special case when a new resources is being sent to a server to assign an identity ([create interaction](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\http.html#create)). The logical identity is unique within the space of all resources of the same type on the same server. Once assigned, the identity is never changed. Note that if the resource is copied to another server, the copy might not be able to retain the same logical identity.

The literal identity of a resource - the actual HTTP address it which it can be accessed - is an absolute URL constructed from the server base address at which it is found, the resource type, and the Logical Id, such as http://test.fhir.org/rest/Patient/123 (where 123 is the Logical Id). Note that implementations SHOULD NOT assume that the identity of a resource is always resolvable to a literal server - it may be temporarily unavailable, or not available by policy (e.g. firewalls) or in some cases, it may not actually exist (e.g. use of resource outside a RESTful environment). Resources reference each other by their identity. These references are allowed to be absolute or relative (see [Resource References](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\references.html) for further discussion). Copying or moving resources from one server to another means that resources acquire a new identity. For further details, see [Managing Resource Identity](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\managing.html).

Logical ids (and therefore literal identities) are case sensitive. Logical Ids are always opaque, and external systems need not and should not attempt to determine their internal structure. A logical id SHALL always be represented in the same way in resource references and URLs. Ids can be up to 64 characters long, and contain any combination of upper and lowercase ASCII letters, numerals, "-" and ".".

#### "Business" Identifiers

In addition to the logical id and literal identity discussed above, many resources contain an element named "identifier", which, if populated, contains a different kind of identifier. As resources are copied from server to server, their literal identity will change, and their logical id may change.

However, all copies of the resource refer to the same underlying concept, and this concept may also be represented in other formats (variously, v2, CDA, XDS, and many more). Each representation carries the same identifier that identifies it consistently across all contexts of use. This is known as the business identifier, and is found in the *identifier* element. In a few resources, there is a *url* element that serves a similar purpose, but is constrained to be a literal URL for implementation reasons.

All resources that have an identifier element support searching by the identifier, so that records can located by that method. So if an HL7 v2 message has the following OBR:

OBR|1|845439^GHH OE|1045813^GHH LAB|1554-5^GLUCOSE^LN|||200202150730|...

Then the DiagnosticReport it represents can be located using the following query:

GET [base]/DiagnosticReport?identifier=1045813

If a FHIR server is a stable server that is the canonical master source for the definition of a concept, the business identifier for all systems may be the same as the literal identity of the resource on the master server.

### Resource Metadata

Each resource contains an element "meta", of type "Meta", which is a set of metadata that provides technical and workflow context to the resource. The metadata items are all optional, though some of all of them may be required in particular implementations or contexts of use.

|  |  |  |
| --- | --- | --- |
| **Metadata Item** | **Type** | **Usage** |
| versionId (0..1) | [id](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\datatypes.html#id) | Changes each time the content of the resource changes. Can be referenced in a [resource reference](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\references.html#Resource). Can be used to ensure that updates are based on the latest version of the resource.  The version can be globally unique, or scoped by the Logical Id of the resource. Version identifiers are generally either a serially incrementing id scoped by the logical id, or a uuid, though neither of these approaches is required. There is no fixed order for version ids - clients cannot assume that a versionId that comes after another one either numerically or alphabetically represents a later version. The same versionId can never be used for more than one version of the same resource.  Note that servers SHOULD support versions, but some are unable to |
| lastUpdated (0..1) | [instant](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\datatypes.html#instant) | If populated, this value changes each time the content of the resource changes. it can be used by a system or a human to judge the currency of the resource content. Note that [version aware updates](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\http.html#update) do not use this element |
| profile (0..\*) | [uri](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\datatypes.html#uri) | An assertion that the content conforms to a resource profile (a [StructureDefinition](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\structuredefinition.html)). See [Extending and Restricting Resources](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\profiling.html#resources) for further discussion. Can be changed as profiles and value sets change or the system rechecks conformance |
| security (0..\*) | [Coding](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\datatypes.html#Coding) | [Security labels](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\security-labels.html) applied to this resource. These tags connect resources in specific ways to the overall security policy and infrastructure. Security tags can be updated when the resource changes, or whenever the security sub-system chooses to |
| tag (0..\*) | [Coding](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\datatypes.html#Coding) | [Tags](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\compartments.html) applied to this resource. Tags are used to relate resources to process and workflow. Applications are not required to consider the tags when interpreting the meaning of a resource. |

[%edt Meta resource.html 1%]

Note that the RESTful API defines some [Operations](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\operations.html) that provide [direct read and write access](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\resource-operations.html#meta) to the *meta* element.

#### Technical vs Business Versions

All resources are conceptually versioned, and each resource sits at the head of a linear list of past versions. The past versions are superseded by the current version, and only available for audit/integrity purposes. The current version is e.g. http://acme.org/fhir/ResourceType/id123, and a past version would be http://acme.org/fhir/ResourceType/id123/\_history/v2.

Note that there's no requirement for servers to keep a history. The [history interaction](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\http.html#history) is provided for where this is an appropriate service to provide. However, whether a server keeps them or not, past versions are dead and gone. The current version of the resource is in the *Resource.meta.versionId*. For a value set this would be:

<ValueSet>

<meta>

<versionId value="v2"/>

</meta>

</ValueSet>

That version changes every time the server updates the resource and writes a new version over the top of an existing one.

Some resources have another version marker in them. For instance, ValueSet has another version in it:

<ValueSet>

<url value="http://acme.com/fhir/ValueSet/example"/>

<version value="2.0"/>

</ValueSet>

This says that this is version 2.0 of the 'example' value set. This is the business version of the value set, the one that humans get involved with. These 2 versions elements have quite different lifecycles. To illustrate, take these cases:

1. A value set is posted to a server (POST [base]/ValueSet) with ValueSet.url = "http://acme.com/valuesets/example". This is identified as the 1st version of the value set (ValueSet.version = 1). When the server gets it, it assigns an identity e.g. ValueSet.id = x1, and ValueSet.meta.versionId = 1. Later, another user creates a revised version of the value set, and this is called version 2. It is committed to the server as an update (PUT [base]/ValueSet/x1).   
   Now, ValueSet.url = http://acme.com/valuesets/example, ValueSet.id = x1, ValueSet.version = 2 and ValueSet.meta.versionId = 2
2. A value set is posted to a server (POST [base]/ValueSet) with ValueSet.url = "http://acme.com/valuesets/example". This is identified as the 1st version of the value set (ValueSet.version = 1). When the server gets it, it assigns an identity e.g. ValueSet.id = x1, and ValueSet.meta.versionId = 1. Then a typo is found in the definition, so this is fixed, but it's still v1 of the value set. This is PUT to [base]/ValueSet/x1. Now, ValueSet.url = http://acme.com/valuesets/example, ValueSet.id = x1, ValueSet.version = 1 and ValueSet.meta.versionId = 2.   
   Later, another user creates a revised version of the value set, and this is called version 2. It is commmited to the server as an update (PUT [base]/ValueSet/x1). Now, ValueSet.url = http://acme.com/valuesets/example, ValueSet.id = x1, ValueSet.version = 2 and ValueSet.meta.versionId = 3
3. A value set is posted to a server (POST [base]/ValueSet) with ValueSet.url = "http://acme.com/valuesets/example". This is identified as the 1st version of the value set (ValueSet.version = 1). When the server gets it, it assigns an identity e.g. ValueSet.id = x1, and ValueSet.meta.versionId = 1. Later, another user creates a revised version of the value set, and this is called version 2. This time, as well as supporting this new version 2, there are production systems still using version 1, and both need to be valid on the value set server. So a new value set is created on the server (POST [base]/ValueSet) and is assigned the identiity 'x2'.   
   Now, there are two different value sets, both with URL "http://acme.com/valuesets/example". One has ValueSet.id = x1, ValueSet.version = 1 and ValueSet.meta.versionId = 1 and the other has ValueSet.id = x2, ValueSet.version = 2 and ValueSet.meta.versionId = 1.

### Implicit Rules

A reference to a [custom agreement](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\profiling.html#agreement) about how the resources are used that was followed when the resource was constructed, and which must be understood when processing the content.

Asserting this rule set restricts the content to be only understood by a limited set of trading partners. This inherently limits the usefulness of the data in the long term, and should be avoided where possible. However, the existing health eco-system is highly fractured, and not yet ready to define, collect, and exchange data in a generally exchangeable sense.

Note that resources are almost always constructed following some custom agreement. Best practice is that such agreements make all knowledge about the content of the resource explicit; if custom agreements do this, and declare their extensions as required, then it is not necessary to understand the agreement when processing the resource content.

### Language

Each resource may have a language element that specifies the base language of the content using a [code defined in BCP 47](http://tools.ietf.org/html/bcp47). The language element is provided to support indexing and accessibility (e.g. text-to-speech use the language tag).

There is no default language, though one may be inferred from the context of use. Not all of the content of the resource has to be in the specified language.

If a language is specified, it should also be specified on the [Narrative Text](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\narrative.html#Narrative). The html language tag in the narrative is used when processing the narrative. The language tag on the resource is provided so that applications processing the data in the resource can specify the language of any alternate presentations generated from the data.

### Tags, Profiles, and Security Labels

These 3 metadata attributes are part of the resource, but are never used to keep information that needs to be understood when interpreting the content of a resource; their function is limited to finding and controlling access to the resource, and connecting resources to technical or clinical workflow.

#### Tags

Tags are used to associate additional operational information with the Resources, including such as workflow management. A typical use of tagging would be to maintain an informal list of resources that need review.

In a general tag, the [coded concept](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\datatypes.html#coding) may be a reference to a healthcare vocabulary, including ones defined in this specification, or vocabularies such as those defined by HL7 for other purposes (e.g. v2 and v3/CDA), LOINC, or SNOMED CT. Alternatively, the concept may be one defined by the implementation in the local context.

The list of tags on a resource is a set, where each tag is unique based on the system+code combination.

#### Profile Tags

A profile assertion represents a claim that the resource conforms to [the identified StructureDefinition](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\structuredefinition.html), which makes rules about what content is allowed to be in a resource. In a profile tag, the term is a URL that references an [identified StructureDefinition](file:///C:\\Users\\Lloyd\\Documents\\SVN\\FHIR\\build\\qa\\structuredefinition.html) resource.

It's always possible to determine whether a resource conforms to any profile simply by testing it against the profile (the [validation tools](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\downloads.html) provide the functionality to perform this test in a variety of contexts). However there are several circumstances where simply examining whether a resource conforms to a particular profile as needed is impractical:

* A server searching a set of resources for ones that conform to a particular profile
* A receiver that has many profiles to choose when validating resource

Profile Tags serve these use cases - a client/creator of a resource can tag the resource with an assertion that the resource conforms to a particular structure definition. The server/receiver of the resource can choose to take this assertion at face value, or to assist in locating the correct [StructureDefinition](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\structuredefinition.html) against which to validate the resource.

Note: resources can conform to multiple profiles at once. A resource can conform to a profile without ever being labeled that it does, or a resource may falsely claim to conform to a profile. For this reason, applications processing resources SHOULD always depend on the contents of the resource when processing them, and/or check resources against the [StructureDefinition](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\structuredefinition.html)s directly rather than relying the existence of profile tags for meaning. Profile Tags are provided as a method of finding resources that conform to a particular [StructureDefinition](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\structuredefinition.html), not statements of meaning about the resource.

Many trading partner agreements will make rules about what claims can be made and when they must be tested, which will make the profile assertion more reliable.

The list of profiles on a resource is a set, where each profile is unique based the value of the URI.

#### Security Labels

A security label is attached to a resource to provide specific security metadata about the information in the resource. For further information, see [Security Labels](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\security-labels.html).

The list of security on a resource is a set, where each tag is unique based on the system+code combination.

### Updates to Tags, Profiles, and Security Labels

When a resource is updated (e.g. on the RESTful interface), servers generally follow this pattern:

* Merge existing and new tags
* Replace existing profile tags with new profile tags
* Merge existing and new security labels

However, in some cases, an update may invalidate existing tags. Servers may update or remove previously existing recognized tags if this is known to be appropriate.

### Maturity Levels

All resources in this specification are assigned a "Maturity Level", known as FMM (after the well known [CMM](http://en.wikipedia.org/wiki/Capability_Maturity_Model) grades). The FMM level can be used by implementers to judge how advanced - and therefore stable - a resource is. The following FMM levels are defined:

1. the resource or profile (artifact) has been published on the current build
2. FMM0 + the artifact produces no warnings during the build process and the responsible WG has indicated that they consider the artifact substantially complete and ready for implementation
3. FMM1 + the artifact has been tested at an HL7 International connectathon
4. FMM2 + the artifact has been subject to a round of formal balloting with at least 10 implementer comments drawn from at least 3 organizations resulting in at least one substantive change
5. FMM3 + the artifact has been tested across its scope, published in a formal publication (e.g. DSTU), and implemented in multiple prototype projects
6. FMM4 + the artifact has been published in two formal publication release cycles and has been implemented in at least 5 independent production systems in more than one country

The Maturity level is strongly related to stability; the higher the maturity level, the more controls are enforced to restrict breaking changes to the resource. For further information, and discussion, see the [FHIR Wiki](http://wiki.hl7.org/index.php?title=FHIR_Maturity_Model).

### Further Information

* [Conformance Rules](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\conformance-rules.html)
* [Resource Definitions](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\resource.html)
* [References between Resources](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\references.html)
* [Narratives](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\narrative.html)
* [Formats:](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\formats.html) [XML](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\xml.html), [JSON](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\json.html)
* [Extensibility](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\extensibility.html) ([Examples](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\extensibility-examples.html))
* [Detailed Descriptions](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\resource-definitions.html)
* [Inter-version Compatibility](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\compatibility.html)

# source\searchparameter\searchparameter-examples-header.xml

# source\searchparameter\searchparameter-introduction.xml

## Scope and Usage

todo

## Boundaries and Relationships

* Profiles are used by [Conformance](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\conformance.html) instances for specifying how resources are used
* Profiles use [Value Sets](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\valueset.html) to specify the content of coded elements
* Profiles can use [Extension Definitions](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\structuredefinition.html) when specifying how a resource is used

## Background and Context

Implementers should be familiar with the background and concepts described in [Profiling FHIR](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\profiling.html) before working with this resource.

# source\searchparameter\searchparameter-notes.xml

## SearchParameters on Extensions

The SearchParameter resource may be used to define searches on extensions. Depending on the context of the extension (as defined in the [StructureDefinition](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\structuredefinition.html)), this may require multiple instances of the SearchParameter.xpath element like so:

* If the extension's context is scoped by a single resource, SearchParameter.base must be set to that resource, and there may be one or more xpath elements corresponding to the elements specified in the extension's context, e.g. "f:Patient/f:name/f:extension[@url='extension url']"
* If the extension's context specifies multiple resources, SearchParameter.base must be set to "DomainResource".
* You may use a single xpath element with the full url of the Extension to indicate that the SearchParameter would search in all elements of the given SearchParameter.base resource for the given extension.

# source\structuredefinition\structuredefinition-examples-header.xml

# source\structuredefinition\structuredefinition-introduction.xml

## Scope and Usage

The StructureDefinition resource describes a structure - a set of data element definitions, and their associated rules of usage. These structure definitions are used to describe both the content defined in the FHIR specification itself - Resources, data types, the underlying infrastructural types, and also are used to describe how these structures are used in implementations. This allows the definitions of the structures to be shared and published through repositories of structure definitions, compared with each other, and used as the basis for code, report and UI generation.

Note that as part of the specification itself, a [full set of structure definitions](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\downloads.html#profiles) for all resources and data types is published.

## Boundaries and Relationships

* StructureDefinitions are used by [Conformance](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\conformance.html) instances for specifying how resources are used
* StructureDefinitions use [Value Sets](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\valueset.html) to specify the content of coded elements
* StructureDefinitions define concrete elements and structures for use with FHIR alone and that have defined wire representations (XML, JSON, etc.). This is distinct from [DataElement](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\dataelement.html) which defines abstract elements that might appear anywhere - FHIR, questionnaire questions, CDA, v2, X12, OpenEHR, a proprietary database, etc. Data elements may map to FHIR resources, data types and/or extensions but do not have any defined wire format of their own.

## Background and Context

Implementers should be familiar with the background and concepts described in [Profiling FHIR](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\profiling.html) before working with this resource.

### Metadata

The StructureDefinition resource has a set of metadata that is mostly shared with the [Value Set](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\valueset.html), [Conformance](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\conformance.html) and other infrastructure resources. The metadata describes the structure, and helps find the structure when registered in profile repositories.

|  |  |
| --- | --- |
| url | The identifier that is used to identify this structure when it is referenced in a specification, model, design or an instance. This URL is where the structure can be accessed |
| identifier | Other identifiers that are used to identify this structure |
| version | The identifier that is used to identify this version of the structure when it is referenced in a specification, model, design or instance. This is an arbitrary value managed by the structure author manually and the value should be a timestamp.  Note that there may be multiple resource versions of the structure that have this same identifier. The resource will have updates that create new versions for technical reasons, whereas the stated version number needs to be under the author's control |
| name | A free text natural language name identifying the structure |
| publisher | Details of the individual or organization who accepts responsibility for publishing the structure. This helps establish the "authority/credibility" of the structure. |
| telecom | Contact details to assist a user in finding and communicating with the publisher |
| description | A free text natural language description of the structure and its use |
| requirements | The Scope and Usage that this structure was created to meet |
| code | A set of terms from external terminologies that may be used to assist with indexing and searching of profiles |
| status | The status of the structure allows filtering of profiles that are appropriate for use vs. not. See the [Status Codes](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\valueset-conformance-resource-status.html) |
| experimental | This structure was authored for testing purposes (or education/evaluation/marketing), and is not intended to be used for genuine usage |
| date | The date that this version of the structure was published |
| fhirVersion | The version of the FHIR specification on which this structure is based. It is not necessary to specify the version, as most profiles are valid across multiple versions, and the validity of a structure against a particular version of FHIR can easily be checked by tooling. |
| type | todo |
| contextType | todo |
| context | todo |

Notes:

* The name of the structure is not required to be globally unique, but the name should have some scoping information (e.g. Acme Inc. (USA), Allergy List)
* Multiple codes may be assigned to the structure. These may either describe the structure, the focus of the structure or both. They are solely to help find the structure by searching for structured concepts
* The 3 status codes (draft, active, and retired) are the codes that are relevant to structure consumers. Authors may wish to use the [authoring-status](#author-status) extension to track the life cycle of a structure as it is prepared

# source\structuredefinition\structuredefinition-notes.xml

## Interpretation Notes:

* A structure is represented as a flat list of elements. The element.path provides the overall structure.
* element.short, element.formal, element.comments and element.mapping provide the specific definition for the field in a specific context.
* element.type is used to specify which types may be used for this element. If there is more than one type, the element offers a choice of types and must have a name that terminates in "[x]". Names of elements that are choices retain the "[x]" in the name, even if a constraint on such an element limits the number of allowed types down to one.
* When using xpath to make constraints about the relationship between the contents of the narrative and the contents of the data elements, the element against which the rule is expressed is the one against which the error or warning will be reported by a validator.
* When xpath constraints refer to elements that offer a choice of types, the statement must use the fully expanded name (including the actual type), not the name ending in "[x]".
* For xpath constraints, the prefix "f" should be used for "http://hl7.org/fhir", and "h" for "http://www.w3.org/1999/xhtml". XPath constraints are written against the XML representation, but the rules they describe SHALL be true in any other representation as well
* The condition element is used to assert that a constraint defined on another element affects the allowed cardinality of this element.

### Different uses for StructureDefinition

The base structure definition is used in a number of different ways to support the FHIR specification. The various uses of the StructureDefinition are controlled by the elements kind, constrainedType, base, and url, using this basic pattern:

{

"url": the identity of this structure definition,

"kind": (datatype | resource),

"constrainedType": the type being constrained (if it's a constraint)

"base": the structure definition from which this is derived

}

This list shows a number of examples, with links to real examples for each:

1. Base definition of a data type (example: [Quantity](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\datatypes.html#Quantity) - [XML](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\quantity.profile.xml.html), [JSON](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\quantity.profile.json.html)):
2. {
3. "resourceType": "StructureDefinition",
4. "url": "http://hl7.org/fhir/StructureDefinition/Quantity",
5. "name": "Quantity",
6. "kind": "datatype",
7. "base": "http://hl7.org/fhir/StructureDefinition/Element",
8. }
9. A constrained data type (example: [Money](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\datatypes.html#Money) - [XML](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\money.profile.xml.html), [JSON](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\money.profile.json.html)):
10. {
11. "resourceType": "StructureDefinition",
12. "url": "http://hl7.org/fhir/StructureDefinition/Money",
13. "name": "Money",
14. "kind": "datatype",
15. "constrainedType": "Quantity",
16. "base": "http://hl7.org/fhir/StructureDefinition/Quantity"
17. }
18. Base definition of a resource (example: [Patient](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\patient.html) - [XML](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\patient.profile.xml.html), [JSON](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\patient.profile.json.html)):
19. {
20. "resourceType": "StructureDefinition",
21. "url": "http://hl7.org/fhir/StructureDefinition/Patient",
22. "name": "Patient",
23. "kind": "resource",
24. "base":"http://hl7.org/fhir/StructureDefinition/DomainResource"
25. }
26. Constraint on a resource (example: [DAF Patient](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\daf\daf-patient.html) - [XML](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\daf\daf-patient.profile.xml.html), [JSON](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\daf\daf-patient.profile.json.html)):
27. {
28. "resourceType": "StructureDefinition",
29. "url": "http://hl7.org/fhir/StructureDefinition/daf-patient",
30. "name": "U.S. Data Access Framework (DAF) Patient Profile",
31. "kind": "resource",
32. "constrainedType": "Patient"
33. "base":"http://hl7.org/fhir/StructureDefinition/Patient"
34. }
35. Base Extension (a standard data type) (example: [Extension](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\extensibility.html#Extension) - [XML](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\extension.profile.xml.html), [JSON](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\extension.profile.json.html)):
36. {
37. "resourceType": "StructureDefinition",
38. "url": "http://hl7.org/fhir/StructureDefinition/Extension",
39. "name": "Extension",
40. "kind": "datatype",
41. "base":"http://hl7.org/fhir/StructureDefinition/Element",
42. }
43. A defined Extension (example: [Extension](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\extension-us-core-race.html) - [XML](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\extension-us-core-race.xml.html), [JSON](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\extension-us-core-race.json.html)):
44. {
45. "resourceType": "StructureDefinition",
46. "url": "http://hl7.org/fhir/StructureDefinition/us-core-race",
47. "name": "A category of humans sharing history, origin or nationality",
48. "kind": "datatype",
49. "constrainedType": "Extension",
50. "base": "http://hl7.org/fhir/StructureDefinition/Extension"
51. }
52. A constraint on a defined extension (no examples currently defined):
53. {
54. "resourceType": "StructureDefinition",
55. "url": "http://example.org/fhir/StructureDefinition/race",
56. "name": "Race codes used by institution (a subset of meaningful use codes)",
57. "kind": "datatype",
58. "constrainedType": "Extension",
59. "base": "http://hl7.org/fhir/StructureDefinition/us-core-race"
60. }

On this list, structure definitions of type 1, 3, and 5 can only be defined by the FHIR specification itself. The other kinds of structure definitions are (or may be) created by the specification, but can also be defined by other implementers.

### Rules for Constrained Types

When the structure is a constraint (constrainedType is not null), then the following rules apply:

* The structure must nominate a base resource from which it is derived
* The structure definition cannot introduce any new elements or value domains that are not valid in the structure - e.g. the structure must be a true constraint, and anything that meets the description of this structure must also be valid following the description of the base structure
* In practice, this means that:
  + no new paths may be introduced that are not found in the base structure
  + the list of types for an element must be the same or a subset of the list of types for the same element in the base structure
  + The definition can be changed in the derived structure, but it must still be logically consistent with the definition in the base. e.g. the base element may be defined as "Result value" and this structure could define it as "Plasma Cholesterol Test Value", but not "Result status".
  + The cardinality must be a subset of the allowable cardinality in the base structure i.e. the minimum must be >= the base minimum, and the maximum must be <= the base maximum
* Note that because of slicing, there can be more than one element for the same path. For details, see [Profiling resources](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\profiling.html)

### Common Mapping Targets

Structures are able to map elements to concepts in other definition systems. Generally these are used to map the elements to local implementation models, data paths, and concepts. However they are also used to map to other standards and published terminologies. These are the standard URIs used for common targets of the mapping:

|  |  |
| --- | --- |
| http://loinc.org | LOINC code for the element |
| http://snomed.info | SNOMED CT code for the element |
| http://hl7.org/v3 | RIM mapping |
| http://hl7.org/v2 | v2 mapping |
| http://nema.org/dicom | DICOM tag mapping |
| http://w3.org/vcard | vCard equivalent field |
| http://ihe.net/xds | XDS metadata equivalent |

# source\subscription\subscription-examples-header.xml

# source\subscription\subscription-introduction.xml

## Scope and Usage

The subscription resource is used to define a push based subscription from a server to another system. Once a subscription is registered with the server, the server checks every resource that is created or updated, and if the resource matches the given criteria, it sends a message on the defined "channel" so that another system is able to take an appropriate action. The server is able to send notifications without any information about the matching resource, or with the entire resource.

Several different types of channels are supported:

* **rest-hook**: A post is made to the URL. If the subscription requests that the whole resource is included, the URL is interpreted as the service base
* **websocket**: An PING message is sent to the designated URI
* **email/sms**: A notification is send to nominated email address or SMS number
* **message**: The resource is sent to the application identified in the URI as a [message](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\messaging.html)

See below for further discussion of the various channels. Note that sending the entire resource creates security concerns that must be managed by the server.

## Boundaries and Relationships

Once a subscription is created, any newly created or updated resources that meet the criteria in the resource cause a notification to be sent using the provided channel. The criterion is a [Search](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\search.html) string that has the same interpretation as if it was appended to the base URL and submitted using the REST API. Note that the search criterion is applied to the new value of the resource. The consequence of this is that there is no notification when a resource is deleted, or when a resource is updated so that it no longer meets the criteria.

As an alternative to subscriptions, the RESTful API describes a polling-based subscription method using [bundles](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\compartments.html#bundle) and the [history operation](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\http.html#history). This method of polling allows for a much tighter relationship between the client and the server that doesn't involve missing updates and/or deletes.

Subscriptions are active resources; a server can only accept a subscription if it will execute the specified channel for any resources subsequently received. The subscription is no longer active once it is deleted from the server.

# source\subscription\subscription-notes.xml

## Safety and Security

Executing each of the channels documented below involves the server sending a communication that will reveal information about the client and server relationship, and, if the entire resource is sent, administrative or clinical information that may be quite sensitive and/or protected under law. Servers are responsible for ensuring appropriate security is employed for each channel. The subscription resource does not address these concerns directly - it is assumed that these are administered by other configuration. For instance, a server might maintain a whitelist of acceptable servers for the rest-create/rest-update methods.

Emails should generally be secured using some technique such as [Direct](http://directproject.org/).

## Managing Subscriptions and Errors

A subscription is defined by creating the subscription on the server. When the subscription is created by the client, it sets the status to "requested". After POSTing the subscription, the client parses the Location header and saves the new Subscription's logical id for use in subsequent operations.

The criteria are subject to the same limitations as the client that created it, such as access to patient compartments etc. Note that the subscription remains active after the client access tokens expire.

Once the server has activated the subscription, it sets the status to "active" (note: the server can do this as it accepts the resource if it wants).

An appropriately authorized client can use search and/or history operations to see what subscriptions are currently active on the server. Once the subscription is no longer desired, the client deletes the subscription from the server.

The server may retry the notification a fixed number of times and/or refer errors to its own alert logs. If the notification fails, the server should set the status to 'error', and mark the error in the resource. If the notification succeeds, the server should update the status to "active again. If a subscription fails consistently a server may choose set the subscription status to off, and stop trying to send notifications.

If a subscription nominates a fixed end date, the server automatically deletes it at the specified time.

## Channels

### REST Hook

This uses an empty POST message to alert the client that new results are available.

POST /Subscription

{

"resourceType": "Subscription",

"criteria": "/Observation?name=http://loinc.org|1975-2&\_format=json",

"channel": {

"type": "rest-hook",

"url": "https://biliwatch.com/customers/mount-auburn-miu/on-result",

"header": ["Authorization: Bearer secret-token-abc-123"]

}

}

When a resource is created or updated that meets the criteria, the server sends a POST request with no body to the nominated URL.

When the client receives a POST to https://biliwatch.com/customers/mount-auburn-miu/on-result, it re-issues the criteria as a query to the server, appending &\_since=:last (where :last is replaced by the time at which the client last checked). In this way it can fetch all new relevant [Observations](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\observation.html).

Since payload is missing, the data in the resources is only available through the REST API, which helps consolidate authorization and authentication logic. The server must append the headers, if any are given, to the POST request that it makes to the client.

Alternatively, the server can be asked to send the entire resource to a nominated FHIR end point. This is usually appropriate for defining routing rules within a managed eco-system such as a healthcare institution.

"channel": {

"type": "rest-hook",

"url": "https://internal.acme.com/research/saturn",

"payload": "application/xml+json"

}

This requests that a server forward a copy of any matching resource in json format to the nominated server as an [Update operation](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\http.html#update) using the nominated URL as the [service base](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\http.html#root). In order to execute this channel, the server must know how to authenticate appropriately with the destination server. This can be done by the subscription resource providing an authentication header for the server to use, or alternatively, the server may be specifically configured to be able to use the nominated server.

### WebSockets

Subscriptions are created exclusively via the FHIR REST API. But notifications need not occur via REST. Indeed, some clients may be unable to expose an outward-facing HTTP server to receive triggered notifications. For example, a pure client-side Web app or mobile app may want to subscribe to a data feed without polling using the /history operation. This can be accomplished using a websocket notification channel.

A client can declare its intention to listen via Web Sockets:

"channel": {

"type": "webSocket"

}

The client would then initiate a Web Socket connection to the server, at a URL advertised in the FHIR server's conformance statement (subscriptions/webSocketUrl (todo)). A simple protocol is used to listen for notifications:

* Client connects a secure Web Socket to the hospital's webSocketUrl.
* Client authenticates to server using a server-specified Web socket protocol (e.g. OAuth bearer token presentation).
* Client sends a bind :id message over the socket (using the logical id of the subscription). For example, the client might issue: bind 123).
* Server responds with a "bound :id" message to acknowledge.
* Server sends a "ping :id" message to notify the client each time a new result is available

### Email/SMS

A client can register for its user to receive notifications by email:

"channel": {

"type": "email",

"url": "mailto:mt-auburn-results@direct.biliwatch.com",

"header": "A new bilirubin result has arrived!"

}

The server would send a new message for each matching resource. The body of the email may be empty, or it may contain a reference to the search or the matching resource. It is at the discretion of the server as to how much information to provide. The email should be secured appropriately, such as using Direct, as specified by the rules of the applicable jurisdictions.

SMS works very similarly:

"channel": {

"type": "sms",

"url": "tel:+1555-345-5555"

}

Note: SMS messages are extremely limited in size, so payload should be set to false Irrespective of size, most servers will refuse to send payloads in SMS for security reasons.

### Messaging

A client can register for its user to receive notifications by [messaging](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\messaging.html):

"channel": {

"type": "message",

"url": "http://ehr.example.org/fhir/$process-message"

}

For each matching resource, a server will send a message to the nominated end-point. Most servers will require that the end-point is white-listed prior to allowing these kinds of subscriptions.

**DSTU Note:** The details of the message - mainly the event code - are still to be resolved during the trial use.

Feedback is welcome [here](http://wiki.hl7.org/index.php?title=FHIR_Specification_Feedback_(DSTU_2)).

# source\devicecomponent\devicecomponent-examples-header.xml

# source\devicecomponent\devicecomponent-introduction.xml

## Scope and Usage

The DeviceComponent resource is used to describe the characteristics, operational status and capabilities of a medical-related component of a medical device. It can be a physical component that is integrated inside the device, a removable physical component, or a non-physical component that allows physiological measurement data and its derived data to be grouped in a hierarchical information organization.

Note:

For the initial scope, this DeviceComponent resource is only applicable to describe a single node in the containment tree that is produced by the context scanner in any medical device that implements or derives from the ISO/IEEE 11073 standard and that does not represent a metric. Examples for such a node are MDS, VMD, or Channel.

## Boundaries and Relationships

The DeviceComponent allows us to change the configuration of the device without having to change the device resource instance. The life-cycle of the configuration may be completely different than the one of the device itself.

There are several related resources

* [Device](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\device.html) - Used by the MedicalDeviceSystem profile
* [Patient](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\patient.html) - Used by the MedicalDeviceSystem profile
* [Location](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\location.html) - Used by the MedicalDeviceSystem profile
* [DeviceComponent](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\devicecomponent.html)

## Background and Context

### Structure of a DeviceComponent Resource

A Context Scanner object of a medical device that implements or derives from ISO/IEEE 11073 standard is responsible for observing device configuration changes. After instantiation, the Context Scanner object is responsible for announcing the object instances in the device's MDIB, a hierarchical containment (MDS->VMD->Channel->Metric). The DeviceComponent resource can be used to describe the characteristics, operational status and capabilities of a medical-related component of a medical device. It can be a physical component that is integrated inside the device, a removable physical component, or a non-physical component that allows physiological measurement data and its derived data to be grouped in a hierarchical information organization. Devices are conceptualized using the following main structure:

1. **MedicalDeviceSystem** - An actual device that external systems communicate with. In 11073, this is known as a MDS.
2. **VirtualMedicalDevice** - A medical-related subsystem of a medical device. It can either be a physical hardware piece or a pure software plugin component of a medical device. In 11073, this is known as a VMD.
3. **Channel** - A non-physical component that allows physiological measurement data and its derived data to be grouped in a hierarchical information organization.

Very simple devices may have only a single virtual device with a single channel and one metric, while complex devices may have multiple items at every level.

# source\devicecomponent\devicecomponent-notes.xml

## Notes:

* The correct codes for the medical device system (MDS), virtual medical device (VMD), and Channel will be specified in the profiles for specific types of device component. Generally, these codes are registered in the [RTM Management service](https://rtmms.nist.gov), but this is not required. See [Terminology Systems](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\terminologies-systems.html#urn:iso:std:iso:11073:10101) for the correct representation of these codes in a [Coding](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\datatypes.html#Coding) data type

# source\devicemetric\devicemetric-examples-header.xml

# source\devicemetric\devicemetric-introduction.xml

## Scope and Usage

The DeviceMetric resource describes mandatory static properties that characterize a direct or derived, quantitative or qualitative bio-signal measurement, setting, or calculation produced by a medical device. The DeviceMetric resource can also be used to describe the non-static but highly relevant properties to the metric such as metric status, metric last calibration time and type, measurement mode, color, reference link to the parent DeviceComponent to where it belongs, and any capabilities that the metric offers (for example: setting the metric label).

Note:

For the initial scope, this DeviceMetric resource is only applicable to describe a single metric node in the containment tree that is produced by the context scanner in any medical device that implements or derives from the ISO/IEEE 11073 standard.

## Boundaries and Relationships

There are two related resources

* [Device](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\device.html) - The physical device that this DeviceMetric belongs to.
* [DeviceComponent](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\devicecomponent.html) - The DeviceComponent that this DeviceMetric is part of. This can be a DeviceComponent of any kind like a VirtualMedicalDevice, a MedicalDeviceSystem, or a Channel.

# source\devicemetric\devicemetric-notes.xml

## Notes:

* The correct codes for the metric types are registered in the [RTM Management service](https://rtmms.nist.gov), but this is not required. See [Terminology Systems](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\terminologies-systems.html#urn:iso:std:iso:11073:10101) for the correct representation of these codes in a [Coding](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\datatypes.html#Coding) data type.

# source\imagingstudy\imagingstudy-examples-header.xml

# source\imagingstudy\imagingstudy-introduction.xml

## Scope and Usage

This resource provides mappings of its elements to DICOM attributes. DICOM attributes are identified by a 32-bit tag, presented in canonical form as two four-digit hexadecimal values within parentheses and separated by a comma, e.g., (0008,103E). The name and value representation (data type) of each attribute can be found in [DICOM Part 6 Data Dictionary](http://medical.nema.org/medical/dicom/current/output/html/part06.html).

The use of the attributes in the context of information objects, including detailed description of use, can be found in [DICOM Part 3 Information Object Definitions](http://medical.nema.org/medical/dicom/current/output/html/part03.html) .

Attributes used in the DICOM query information models, such as â€œNumber of Instances in Studyâ€, can be found in [DICOM Part 4 Annex C](http://medical.nema.org/medical/dicom/current/output/html/part04.html#chapter_C).

# source\imagingstudy\imagingstudy-notes.xml

### Implementation Notes

* Instances can be images, but they can also be DICOM structured documents or other DICOM classes
* This resource follows DICOM practice in using OIDs for elements such as instance type rather than codes.
* Each instance has an Attachment. Multiple Attachments can represent the same information, but using different approaches. The ImagingStudy.content.url could be a reference to a WADO-RS service that makes the instance available. The ImagingStudy.content.url could be a reference to a FHIR resource ([Media](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\media.html), [Composition](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\composition.html), etc.).
* The use of ImagingStudy.content.data is discouraged with preference of url.

### Use Case

Joe Angina complains of shortness of breath and occasional chest pain to his primary care physician, Dr. Pat Down at Local MultiClinic, who orders a stress echocardiogram; the order is created as a FHIR Order resource to manage the workflow, with a link to a DiagnosticOrder resource with the details of the request. The order is scheduled and assigned to cardiologist Dr. Art Skann, also at Local MultiClinic.

On the scheduled day of the exam, Joe arrives at the echo lab to meet with Dr. Skann and have the study done. Dr. Skannâ€™s workstation shows the daily list of Orders, and he follows the link to retrieve the DiagnosticOrder. (He may follow the links through the referenced Patient resource to access Joeâ€™s electronic medical record, but that is not the concern of this storyboard.)

The Order/DiagnosticOrder has been transcoded to a DICOM Modality Worklist Scheduled Procedure Step, and in the echo lab the equipment has downloaded the Modality Worklist. The study is performed, and the acquired images and sonographerâ€™s preliminary measurements are stored in the Local MultiClinic Picture Archiving and Communication System (PACS). The PACS creates an ImagingStudy resource for each study it manages.

Dr. Skann interprets the study on a PACS workstation, and he selects two key image frames to be included in the diagnostic report; this selection is stored back to the PACS as a DICOM Key Object Selection with the title â€œFor Report Attachmentâ€, and the PACS makes it available (transcodes it) as a FHIR ImagingObjectSelection resource. Dr. Skann dictates the report using a structured data entry report writing program, including a recommendation for a cardiac catheterization procedure, and signs it. The report writing program formats the report as a CDA document, retrieves the ImagingObjectSelection resource, and inserts the referenced key images into the report.

Dr. Down meets again with Joe, and they review the results of the stress test. Joe has a question about the findings that the key images in the report do not show, so Dr. Down uses the Local MultiClinic EMR to query the PACS for the full ImagingStudy resource, and uses the references there to open an image display for the full study. Joe agrees to proceed to catheterization, and Dr. Down sends a referral to the Ginormous University Hospital cath department, and triggers the PACS to share the echo study through the Metropolitan Health Information Exchange.

The PACS creates a manifest of the study as an ImagingObjectSelection resource, which includes all the images but excludes the sonographerâ€™s preliminary measurements (which as a matter of policy are not shared outside the Local MultiClinic). The manifest is published to the Metro HIE. (In accordance with IHE XDS-I, the images themselves are not directly published to the HIE, but available for on-demand retrieval from the PACS.)

At Ginormous Hospital, Dr. Cora Plummer receives the cath referral, and looks up the study in the Metro HIE registry. She retrieves the study manifest ImagingObjectSelection, and uses it to access the shared images, which she uses to prepare for the cath procedure.

# source\imagingobjectselection\imagingobjectselection-examples-header.xml

# source\imagingobjectselection\imagingobjectselection-introduction.xml

## Scope and Usage

This resource summarizes a set of images or other instances gathered for some specified purpose, and provides references to where the images are available using WADO-RS. This resource is used to make available information concerning images etc. that are intended to be exchanged into other clinical contexts such as diagnostic reports, Care Plans, etc.

# source\imagingobjectselection\imagingobjectselection-notes.xml

### Use Case

Joe Angina complains of shortness of breath and occasional chest pain to his primary care physician, Dr. Pat Down at Local MultiClinic, who orders a stress echocardiogram; the order is created as a FHIR Order resource to manage the workflow, with a link to a DiagnosticOrder resource with the details of the request. The order is scheduled and assigned to cardiologist Dr. Art Skann, also at Local MultiClinic.

On the scheduled day of the exam, Joe arrives at the echo lab to meet with Dr. Skann and have the study done. Dr. Skannâ€™s workstation shows the daily list of Orders, and he follows the link to retrieve the DiagnosticOrder. (He may follow the links through the referenced Patient resource to access Joeâ€™s electronic medical record, but that is not the concern of this storyboard.)

The Order/DiagnosticOrder has been transcoded to a DICOM Modality Worklist Scheduled Procedure Step, and in the echo lab the equipment has downloaded the Modality Worklist. The study is performed, and the acquired images and sonographerâ€™s preliminary measurements are stored in the Local MultiClinic Picture Archiving and Communication System (PACS). The PACS creates an ImagingStudy resource for each study it manages.

Dr. Skann interprets the study on a PACS workstation, and he selects two key image frames to be included in the diagnostic report; this selection is stored back to the PACS as a DICOM Key Object Selection with the title â€œFor Report Attachmentâ€, and the PACS makes it available (transcodes it) as a FHIR ImagingObjectSelection resource. Dr. Skann dictates the report using a structured data entry report writing program, including a recommendation for a cardiac catheterization procedure, and signs it. The report writing program formats the report as a CDA document, retrieves the ImagingObjectSelection resource, and inserts the referenced key images into the report.

Dr. Down meets again with Joe, and they review the results of the stress test. Joe has a question about the findings that the key images in the report do not show, so Dr. Down uses the Local MultiClinic EMR to query the PACS for the full ImagingStudy resource, and uses the references there to open an image display for the full study. Joe agrees to proceed to catheterization, and Dr. Down sends a referral to the Ginormous University Hospital cath department, and triggers the PACS to share the echo study through the Metropolitan Health Information Exchange.

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At Ginormous Hospital, Dr. Cora Plummer receives the cath referral, and looks up the study in the Metro HIE registry. She retrieves the study manifest ImagingObjectSelection, and uses it to access the shared images, which she uses to prepare for the cath procedure.

# source\dataelement\dataelement-11179-profile-introduction.xml

### Scope and Usage

This profile defines extensions that may be useful in exposing data elements from [ISO 11179](http://metadata-standards.org/11179)-conformant registries. The list of extensions is not currently complete - additional extensions would be required to support all required and optional 11179 elements. The set of define extensions will increase over time based on implementer interest. At some point, a full profile for 11179-conformant systems may be developed.

The list of defined extensions is as follows:

* **objectClass** - specifies the Object\_Class for a Concept\_Element or the meaning of a Data\_Element
* **property** - specifies the Object\_Class Property for a Concept\_Element or the meaning of a Data\_Element

# source\dataelement\dataelement-examples-header.xml

# source\dataelement\dataelement-introduction.xml

## Scope and Usage

DataElement is an infrastructure resource that supports the defining individual pieces of data that might be collected or stored. While these definitions might apply to elements found in FHIR resources and profiles, they can also apply to questionnaire questions, elements in data stores, and non-FHIR specification (v2, CDA, CDISC, etc.) I.e. the definitions aren't FHIR-specific.

This resource covers two major use-cases:

1. Definitions of types of measurements or observations that may be requested or performed. In HL7, these are sometimes referred to as service, test or observation "master files"
2. Definitions of "data elements" (DEs) that may be used in [questionnaires](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\questionnaire.html) (survey instruments and data collection forms) and [profiles](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\profile.html) and potentially mapped to elements in other resources and profiles

The purpose of the first use-case is to allow systems to identify what types of lab orders, diagnostic studies and other types of observations may be requested or performed within a particular organization or other context. An ordering practitioner can query for a list of data elements by category name or other criteria and identify which, within a set of similar tests, they wish to request to be performed.

The focus of the second use-case is standardizing data capture and reporting. By defining standard names, data capture constraints, questions and other characteristics, the data gathered within and across organizations via questionnaires, as part of clinical studies, etc. can be made more consistent. When designing clinical studies, constructing questionnaires, building profiles or performing other tasks that involve determining what data will be captured or exchanged and how, designers can query to find pre-defined data element definitions they can leverage or map to. By encouraging consistency around data element definitions, data types, value sets, string lengths and other constraints, data becomes more easily exchangeable and comparable across systems. This benefits interoperability and clinical research. (For more discussion, see the section on [standardization](#standardization) below.)

The scope covers base capabilities of the ISO 11179 Metadata Registries specification which defines DEs. It also covers observation definitions by ontologies such as LOINC. The term "observation" is interpreted in its broadest sense as "any element that might be thought of as the 'value' in a name-value pair". So it includes such concepts as patient gender, practitioner address and other data elements that would not typically be captured using the [Observation](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\observation.html) resource.

## Boundaries and Relationships

This resource has significant overlap with [StructureDefinition](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\structuredefinition.html) and [Questionnaire](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\questionnaire.html).

[StructureDefinition](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\structuredefinition.html) also defines data elements. However, it does so only in the context of FHIR-specific artifacts (FHIR resources, data types and profiles). As well, StructureDefinition typically identifies a number of data elements together in context. **DataElement** defines only a single data element and it does so in a manner that is not directly tied to FHIR. Data elements might define the value of an [Observation](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\observation.html), constrain the allowed answer to a question in a [Questionnaire](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\questionnaire.html) (including providing a list of permitted answers), describe the permitted value captured of an element in some other resource ([Patient](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\patient.html), [FamilyMemberHistory](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\familymemberhistory.html), etc.) or even used outside FHIR entirely in a CDA document or HL7 v2 specification.

[Questionnaire](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\questionnaire.html) is to both define forms, surveys and other structures that can be filled out. [Questionnaire](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\questionnaire.html) also defines data elements. However, it does so only in the context of a particular questionnaire design. In contrast, **DataElement** is focused on defining data elements independent of their use in questionnaires and other structures. A single **DataElement** might be referenced in numerous [Questionnaire](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\questionnaire.html)s, or even potentially in multiple places within a single [Questionnaire](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\questionnaire.html). This reference might either be implicit or may be explicit through an extension. (For implementability reasons, the data constraints should still be explicitly exposed within the [Questionnaire](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\questionnaire.html) rather than being included "by reference" to the **DataElement**.)

**Note**: Extensions on **DataElement** that define the characteristics of a data element will typically also be applicable to [Profile](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\profile.html)'s ElementDefinition and [Questionnaire](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\questionnaire.html)'s Question data element as both are also used to define the characteristics of a data element.

**DSTU Note:** Should a shared structure be used in [StructureDefinition](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\structuredefinition.html), [Questionnaire](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\questionnaire.html) and **DataElement** to capture constraints on data elements, or is it acceptable for them to continue to be maintained in a separate, but "similar" manner?

Feedback is welcome [here](http://wiki.hl7.org/index.php?title=FHIR_Specification_Feedback_(DSTU_2)).

**DataElement** differs from [Observation](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\observation.html) in that it describes what kind of observations **can** occur, while [Observation](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\observation.html) focuses on a specific observation of a specific subject at a particular time that **has** occurred.

# source\dataelement\dataelement-notes.xml

### Relationship to ISO 11179

One of the sources of the **DataElement** resource definition was the [ISO 11179](http://metadata-standards.org/11179/) Metadata Registries specification. It defines a logical model for the classification, identification, naming and registration of Data Elements, Data Element Concepts and their associated Value and Conceptual Domains.

The **DataElement** resource can be used to represent both Data\_Element and Data\_Element\_Concept in the ISO logical model. (The [ValueSet](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\valueset.html) resource provides the details for Value\_Domain and Conceptual\_Domain for enumerated elements.) The determination of whether a **DataElement** resource instance is an ISO 11179 Data\_Element or Data\_Element\_Concept is determined by whether the type property is specified - which corresponds to the ISO property Data\_Element.domain.datatype which is required for Data\_Elements. I.e. If DataElement.type is present; the instance represents a 11179 data element. If DataElement.type is absent, the instance represents a 11179 data element concept.

Unlike the 11179 logical specifications, the **DataElement** resource does not require a linkage from data element to a distinct data element concept, though this linkage can be established through an extension if desired. The typical means of identification of the data element concept is expected to instead occur through the mapping of the data element to a particular code or reference model that formally defines the concept. It is possible this reference model could be based on ISO's Object\_Class and Property mechanism. However, mappings to other reference models are also possible, for example:

* HL7's [Reference Information Model](http://www.hl7.org/implement/standards/rim.cfm)
* [Open EHR's](http://www.openehr.org/) reference model
* the [BRIDG](http://bridg.com) logical model
* terminologies such as [LOINC](http://loinc.org) or [SNOMED](http://www.ihtsdo.org/snomed-ct/)

In the event of multiple codes and/or mappings, the "authoritative" mapping (the one formally defining the concept) is identified by either setting the "primary" element on the code or by specifying the "primary mapping" ISO 11179 extension.

It is possible to create instances that are "conforming", or even "strictly conforming" to the 11179 specification. However, doing so will require the use of extensions to convey certain properties that are not part of the core resource and data types. An initial starter [ISO 11179 profile](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\dataelement-11179.html) is included in the FHIR specification. It defines extensions that are relevant to the [SDC DataElement](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\sdc\dataelement-sdc.html) profile. If there is sufficient interest, the existing starter set may be enhanced to contain a complete set of extensions and a full 11179 in a future release of the specification.

### Data Elements vs. Codes

Data elements (and their registries) and codes (and their code systems) serve different purposes. Data elements describe the characteristics of a piece of data - identifier, name, definition, data type, length, permitted value set, usage notes, etc. On the other hand, while codes describe a particular concept including a symbol for use when exchanging the concept, display names, definitions and often relationships to other concepts. There is a subset of information that is common for both codes and data elements - identifier, name and definition. Because of this, a list of data elements might sometimes be seen as a list of codes.

One of the purposes of data elements is to define variables, observations, or questions that include information about how to collect a variable's value--including information about data types and guidance about the use of about answer lists and/or units of measure. This function is typically done by code systems such as [LOINC](http://loinc.org) and [SNOMED CT](http://www.ihtsdo.org/snomed-ct/). (Note that LOINC provides considerable detail about allowed answers, while most other code systems such as SNOMED only allow identifying the question.) It would be possible to treat a registry of data elements using a common identifier system/namespace as a code system. Similarly, data elements can be mapped to each other (and to codes) in the same manner as codes can be mapped by making use of the [ConceptMap](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\conceptmap.html) resource.

That said, FHIR treats code systems as simple structures that provide identity, names and definitions. Code systems that provide significant additional detail (recommended doses for drugs, data types for data elements, etc.) are treated as a mix of a code system together with a supplementary resource to provide the details. Refer to the [Code systems with detailed metadata](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\valueset.html#detailed-metadata) section of [ValueSet](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\valueset.html) resource for additional discussion of the relationship between DataElement and code systems.

### Standardization through governance and registries

As noted in the introduction, one of the main purposes for the use of data elements is 'standardization' - gaining consistent (and thus comparable) data capture of data in [questionnaires](C:\\Users\\Lloyd\\Documents\\SVN\\FHIR\\build\\qa\\questionnaire.html), [observations](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\observation.html) and within other resources. However, merely defining data elements is not, in itself, sufficient to improve standardization. To ensure consistency of data, there needs to be several additional things:

* There must be a shared repository of data elements that will be consulted and used by the community where improved interoperability is targeted. Numerous groups will define and register data elements in a wide variety of repositories for a wide variety of purposes. To improve interoperability, everyone in the target community needs to be working from the same set.
* There must be governance over the repository of data elements to ensure consistency of granularity and reference structures - those designing questionnaires, profiles, etc. need to be able to find the appropriate data element easily within the repository and there should ideally only be one data element for a given purpose. If a repository accepts 15 data elements defining different ways of capturing the same piece of information, there will be no improvement in interoperability.
* There must be incentives or governance processes in place that encourage or require the use of data elements from the shared repository when defining forms, profiles and other structures where improved interoperability is desired.
* There must be allowance for (and a transition path for) legacy systems that capture data or have existing data that is not in alignment with the approved data elements.

**Data Elements** are a tool through which improved standardization can be achieved but without adequate processes, they will not achieve significant benefit.

### Data Element granularity and hierarchy

Data elements can be defined at a wide variety of granularities. For example:

* Systolic Blood pressure
* Systolic Blood pressure (sitting)
* Systolic Blood pressure (sitting, pressure cuff)
* Systolic Blood pressure (sitting, pressure cuff) mmHg

Coded data elements can be defined without value sets, with suggested value sets, with required but extensible value sets or with completely locked down value sets. Numeric values can be defined with or without allowed ranges. String data can be defined with or without patterns or lengths. All are valid data elements.

When defining data elements, it's important to decide what level of detail/granularity is appropriate for the intended purpose. The tighter the data element is defined, the greater interoperability of the data, however the smaller the set of systems that will be able to satisfy the constraints and the larger the number of data elements that will be required to cover a given domain. In some cases, multiple granularities may be appropriate, though this can introduce challenges in ensuring that the appropriate granularity is selected for a given use. As a rule, data elements should be defined as loosely as possible while still ensuring that all data captured using the data element will be sufficiently comparable to meet the needs of the group defining and using the data elements. A corollary to this is that data elements defined by one group will not always meet the needs of another group, even if they may be covering the same domain.

### Comparability and conversion of data elements

Two pieces of data don't necessarily need to be based on the same data element in order to be comparable or aggregately. As noted above, it's possible for one data element to be a proper subset of another. In addition, it may be possible to convert data from being conformant with one data element to being conformant with another data element. This conversion could be lossless or may involve some loss of semantic precision. For example, a weight measurement captured in pounds can be seamlessly converted to kilograms. Similarly, coded data captured using one value set can be converted to another value set provided mappings are available. The nature of the mappings would determine whether any loss of semantics would occur.

### Data Element stringency

The stringency element allows identifying the types of usages for which the data element is appropriate. Some uses (direct comparison of data, auto-population of data, etc.) are inappropriate with loose definitions of elements. On the other hand, overly-restrictive data elements can result in a large number of data elements and limited abilities to compare similar but not identical data. For now, the definition of what level of constraints are appropriate/necessary for a given level of stringency is left to implementers, though future versions this specification may assert at least some level of guidance in this area.

### Definitions

Data elements provide their value by clearly defining the meaning and content of a particular type of data to be exchanged. This value depends on the meaning associated with the element being clear for all potential implementers of the element. I.e. For a data element to be useful, it needs to have a good quality definition. Characteristics of good quality definitions include:

* The definition does not use the name of the element as part of the definition - it should provide additional information above and beyond the name.
* The definition should be more than one or two words.
* Ideally, the definition should be phrased in a manner such that the definition could be substituted for the data element name in a sentence. E.g. "gender" might be defined as "the sexual identity of a person as used for administrative purposes"
* If the data element does not have a value set and does not make use of a simple type such as date, integer or boolean, it should list several example values as part of the definition.
* Information about the rationale for the element or additional usage notes should not be conveyed as part of the definition but should instead make use of the notes or rationale elements.

### Data Elements and Access Control

Because Data Elements define precise pieces of data that can be conveyed in a variety of places, they may form a useful mechanism for the definition of fine-grained data access controls. The base resource does not include mechanisms for linking access controls directly do data elements, however, an extension could allow a particular data element to be associated with particular [Security Labels](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\security-labels.html). Whether this level of control is appropriate may vary by implementation environment.

### References to and from Data Elements

One of the primary purposes of the DataElement resource is to allow data conveyed in a variety of different forms to be "linked" to the data element and identified as being equivalent/comparable/semantically-aligned. There are a variety of different ways this can occur:

* DataElement.element.code allows a data element to be linked as "semantically equivalent" to the specified code.
* DataElement.element.mapping allows a data element to be linked to a particular data structure such as a FHIR resource, a CDA template, an OpenEHR archetype, etc.
* The [Questionnaire](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\questionnaire.html) extension [deReference](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\extension-questionnaire-dereference.html) allows a particular question in a questionnaire to be linked to a data element deemed to correspond to that question. This mechanism supports population of questionnaire instances on the basis of known data elements. The intent is that a server will populate anything it recognizes by data elements. However servers may not know all the data elements, and won't populate ones that they don't know.

# source\device\device-examples-header.xml

# source\device\device-introduction.xml

## Scope and Usage

This resource is primarily used for recording which device performed an action and can also be used to track device location. It is also used for prescribing and dispensing devices for patient use. If the device is implanted in a patient, then the patient element will be present, and there would be no location.

## Boundaries and Relationships

These are the device related resources

* Device (this resource) - An administrative resource that tracks individual device types or instances of a device and their location. It Is referenced by other resource for recording which device performed an action such as a procedure or an observation. It is also referenced when prescribing and dispensing devices for patient use or for ordering supplies.
* [DeviceMetric](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\devicemetric.html) - Describes a measurement, calculation or setting capability of a medical device.
* [DeviceComponent](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\devicecomponent.html) that the DeviceMetric is part of. This can be a DeviceComponent of any kind like a VirtualMedicalDevice (VMD), a MedicalDeviceSystem (MDS) , or a Channel

In FHIR, the "Device" is the "administrative" resource for the device (it does not change much and has manufacturer information etc.), where as the DeviceComponent and DeviceMetric (which is really a kind of DeviceComponent) model the physical part, including operation status and is much more volatile. The physical composition of a Device is done by the DeviceComponents pointing to their "parent" component using [DeviceComponent.parent](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\devicecomponent-definitions.html#DeviceComponent.parent), e.g. channel to VMD and VMD to the MDS. All components point to the "logical" Device they belong to, using [DeviceComponent.source](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\devicecomponent-definitions.html#DeviceComponent.source). Similarly, if for example you want to express which logical device your observation came from, you can just use Device, but if you need to be more specific observation can point to DeviceMetric which in turn points to the "logical" Device it belongs to, using [DeviceMetric.source](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\devicecomponent-definitions.html#DeviceMetric.source).

Devices that are implanted in a patient differ from medications because they are not "used up" - they remain active in a patient in an ongoing fashion. The [Medication resource](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\medication.html) SHOULD not be used to represent implanted devices.

# source\device\device-notes.xml

### Notes

#### Device Types

There are many sources of possible codes for device type. The example uses device codes from Global Medical Device Nomenclature (GMDN®). Another source which may be appropriate is RTM (Rosetta Terminology Mapping). The local UDI repository (in the US this is the GUDID database) is another source as well, however, the full UDI string is placed in the Device.udi element. Alternatively, many jurisdictions have their own supply chain arrangements which define many useful codes.

#### Device Identifiers

Nearly all devices are assigned one or more identifiers, which are usually printed or affixed to the device using either barcodes or RFIDs. The identifiers can come from the manufacturer (often called the "serial number," "reference number," or "catalog number"), various institution and registries. Any of these identifiers assigned to the device can and should be recorded in the device resource. The different identifiers are differentiated by their use, label, and system values.

The most important of the identifiers is the [US Realm FDA Mandated Unique Device Identifier](http://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/UniqueDeviceIdentification/default.htm) (UDI) required by the FDA for every medical device to bear on its label (unless excepted). The UDI has 2 components - the device identifier (DI), which is assigned at the version/model level of the device and the production identifier(s)(PI) which provide the means to track a device through its manufacture, distribution and use. The UDI string may also contain additional elements which are not formally part of the local defined UDI elements but which are non-the-less contained within the same string and are of value locally. The DI of the UDI may be stored in a jurisdictional repository and used as the primary key to access other device information. The UDI may identify an instance of a device uniquely (when the PI(s) include a serial number), or it may just identify the type of the device. The UDI can be broken into its constituent parts (DI, PI and other elements) by parsing rules developed by each Issuing Agency standard. Where the device has an assigned UDI, the other details carried in the resource (e.g. lot, expiry date etc.) SHALL be consistent with the information encoded in the UDI string or registered in the local repository. In the US, a UDI will be required by the FDA for every medical device to bear on its label (unless excepted). The DI of the UDI is submitted in a device record to the [Global Unique Device Identification Database](http://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/UniqueDeviceIdentification/GlobalUDIDatabaseGUDID/ucm20038750.htm) (GUDID) and is used as the primary key to access other device information.

Note that a GTIN (sometimes also called an EAN number) is a code developed by GS1 for the kind of device not an identifier for the device. A GTIN may appear on its own or it may appear in a UDI string as the DI component.

GTIN example

<type>

<coding>

<system value="urn:oid:1.3.160â€Ž"/>

<value value="00614141999996"/>

</coding>

<!-- other codes for type -->

</type>

# source\diagnosticorder\diagnosticorder-examples-header.xml

# source\diagnosticorder\diagnosticorder-introduction.xml

## Scope and Usage

A *Diagnostic Order* is a record of a request for a set of diagnostic investigations to be performed. The investigation will lead to a [Diagnostic Report](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\diagnosticreport.html) that summarizes the outcome of the investigation, and includes any useful data and/or images that are relevant to the treatment/management of the subject.

The principal intention of the *Diagnostic Order* is to support ordering diagnostic investigations on patients (which includes non-human patients in veterinary medicine). However in many contexts, healthcare related processes include performing diagnostic investigations on groups of subjects, devices involved in the provision of healthcare, and even environmental locations such as ducts, bodies of water, etc. The *Diagnostic Order* supports all these usages.

The general work flow that this resource facilitates is that a clinical system creates a diagnostic order. The diagnostic order is then exchanged, perhaps via intermediaries, with a system that represents a diagnostic service that can perform the investigation as a request to do so. The diagnostic service will update the request as the work is performed, and then finally issue a report that references the requests that it fulfills.

## Boundaries and Relationships

DiagnosticOrder is closely related to other types of "request" resources, particularly ReferralRequest and ProcedureRequest. In fact, for some services, it may be appropriate to use any one of these resources to request that the service be performed. Which one is used may be driven by organization practice and by context. When it is unclear which to use, the following principles may be helpful:

* ProcedureRequest or DiagnosticOrder are typically used when the requesting clinician has and wishes to exercise the authority (and expertise) to decide exactly what action will be done.
* A ReferralRequest is used when the requesting practitioner is seeking another practitioner or organization to use their own expertise and/or authority to determine the specific action to take.
* Whether an activity is deemed to be a procedure or only a diagnostic order is typically driven by how invasive the diagnostic process is. More invasive processes are typically represented as procedures, though the dividing line will vary by organization.

Irrespective of the guidance above, systems should be prepared for some degree of overlap between these resources and be prepared to execute searches against multiple resources in cases where differentiation cannot be guaranteed. As well, in some workflows more than one type of resource or even all three might exist. E.g. Upon receiving a ReferralRequest a practitioner might initiate a DiagnosticOrder. The diagnostic service might then initiate a ProcedureRequest.

The DiagnosticOrder supports references to the numerous other resources that define information about the subject, the orderer, associated encounter, specimen the bodysite and other supporting information. For example, Patient, Practitioner Specimen and Condition are all referenced in this resource. While some systems may choose to bundle up a DiagnosticOrder and this referenced information into a Document for delivery to the recipient. However, REST, Messaging and Services are also valid architectures for managing referrals and may be more appropriate where active workflow management is needed.

The CarePlan resource can be used to describe more sophisticated requests for combinations of services and DiagnosticOrder may be referenced as part of a CarePlan. Similarily ClinicalImpression resource can ireference DiagnosticOrder as part of a followup to plan to the assessment.

Note that the Diagnostic Order itself is not a request to perform the investigation - but rather a record of the fact that a request was made. To actually initiate the workflow beyond simply the existence of a Diagnostic Order may be required. This can be achieved by using an Order resource, with the Diagnostic Order referenced from the Order.details, or by using the Diagnostic Order resource in the context of an messaging or service workflow where the request is explicit or implicit."

# source\diagnosticorder\diagnosticorder-notes.xml

## Notes:

* In normal practice, there would always be at least one item in a request (no point requesting nothing), but the minimum cardinality is 0 so that a workflow can quote order details (identifiers, requester) without having to list the items
* Typically the system placing the order sets the status to requested. There after, the order is maintained by the receiver that updates the status as the request is processed
* If the request has multiple items that have their own life cycles, then the items will have their own status while the overall diagnostic order is (usually) "in-progress"
* The event list is not the same as an audit trail - it is a view of the important things that happened in the past. Typically, there would only be one entry for any given status, and systems may not record all the status events
* Many investigation requests will create a need for specimens, but in these cases, the request itself is not actually about the specimens. This specimen elements in this resource are provided for when the diagnostic investigation is requested on already existing specimens
* A single specimen should not appear in both DiagnosticOrder.specimen and DiagnosticOrder.item.specimen - DiagnosticOrder.specimen should only be used when the entire order relates to a single specimen, and then there is no need to repeat it for each item
* The reason is often for billing purposes. May relate to the resources referred to in supportingInformation and used to decide how the diagnostic investigation will be performed, or even if it will be performed at all
* The identifier.type element is used to distinguish between the identifiers assigned by the orderer (known as the 'Placer' in HL7 v2) and the producer of the observations in response to the order (Known the 'Filler' in HL7 v2). Use the identifier type code "PLAC" for the Placer Identifier and "FILL" for the Filler identifier. See the example code below:
* <!-- Placer identifier-->
* <identifier>
* <type>
* <coding>
* <system value="http://hl7.org/fhir/identifier-type"/>
* <code value="PLAC"/>
* </coding>
* <text value="Placer"/>
* </type>
* <system value="urn:oid:1.3.4.5.6.7"/>
* <value value="2345234234234"/>
* </identifier>
* <!-- Filler identifier-->
* <identifier>
* <type>
* <coding>
* <system value="http://hl7.org/fhir/identifier-type"/>
* <code value="PLAC"/>
* </coding>
* <text value="Placer"/>
* </type>
* <system value=" http://hl7.org/fhir/identifier-type"/>
* <value value="567890"/>
* </identifier>

# source\diagnosticreport\diagnosticreport-examples-header.xml

# source\diagnosticreport\diagnosticreport-introduction.xml

## Scope and Usage

A diagnostic report is the set of information that is typically provided by a diagnostic service when investigations are complete. The information includes a mix of atomic results, text reports, images, and codes. The mix varies depending on the nature of the diagnostic procedure, and sometimes on the nature of the outcomes for a particular investigation. In FHIR, the report can be conveyed in a variety of ways including a [Document](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\documents.html), [RESTful API](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\http.html), or [Messaging](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\messaging.html) framework. Included within each of these, would be the DiagnosticReport resource itself.

The DiagnosticReport resource has information about the diagnostic report itself, and about the subject and, in the case of lab tests, the specimen of the report. It can also refers to the request details and atomic observations details or image instances. Report conclusions can be expressed as a simple text blob, structured coded data or as an attached fully formatted report such as a PDF.

The DiagnosticReport resource is suitable for the following kinds of diagnostic reports:

* Laboratory (Clinical Chemistry, Hematology, Microbiology, etc.)
* Pathology / Histopathology / related disciplines
* Imaging Investigations (x-ray, CT, MRI etc.)
* Other diagnostics - Cardiology, Gastroenterology etc.

The DiagnosticReport resource is not intended to support cumulative result presentation (tabular presentation of past and present results in the resource). The DiagnosticReport resource does not yet provide full support for detailed structured reports of sequencing; this is planned for a future release.

## Background and Context

**Diagnostic Report Names**

The words "tests", "results", "observations", "panels" and "batteries" are often used interchangeably when describing the various parts of a diagnostic report. This leads to much confusion. The naming confusion is worsened because of the wide variety of forms that the result of a diagnostic investigation can take, as described above. Languages other than English have their own variations on this theme.

This resource uses one particular set of terms. A practitioner "requests" a set of "tests". The diagnostic service returns a "report" which may contain a "narrative" - a written summary of the outcomes, and/or "results" - the individual pieces of atomic data which each are "observations". The results are assembled in "groups" which are nested structures of Observations (traditionally referred to as "panels" or " batteries" by laboratories) that can be used to represent relationships between the individual data items.

## Boundaries and Relationships

Note that many diagnostic processes are procedures that generate observations and diagnostic reports. In many cases, such an observation does not require an explicit representation of the procedure used to create the observation, but where there are details of interest about how the diagnostic procedure was performed; the [Procedure resource](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\procedure.html) is used to describe the activity.

In contrast to the [Observation resource](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\observation.html), the DiagnosticReport resource typically includes additional clinical context and some mix of atomic results, images, imaging reports, textual and coded interpretation, and formatted representations. Laboratory reports, pathology reports, and imaging reports should be represented using the DiagnosticReport resource. The Observation resource is referenced by the DiagnosticReport to provide the atomic results for a particular investigation.

If you have a highly structured report, then use DiagnosticReport - it has data and workflow support. Details about the request for a diagnostic investigation are captured in the various "request" resources (e.g. the [DiagnosticOrder resource](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\diagnosticorder.html)) and allow the report to connect to clinical workflows. For more narrative driven reports, with less work flow (history/mortuary etc.) [Composition resource](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\composition.html) would be more appropriate.

**DSTU Note:** The relationship between the two resources is subjecto ongoing evaluation during the trail use period.

Feedback is welcome [here](http://wiki.hl7.org/index.php?title=FHIR_Specification_Feedback_(DSTU_2)).

Image and media representations of the report and supporting images are referenced in the DiagnosticReport resource. The details and actual image instances can be referenced directly in Diagnostic report using the "imaging" element or by indirect reference through the [ImagingObjectSelection](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\imagingobjectselection.html) or [ImagingStudy](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\imagingobjectselection.html) resources which represent the content produced in a DICOM imaging study or set of DICOM Instances of a patient.

# source\diagnosticreport\diagnosticreport-notes.xml

Examples of nested report groups: the antibody hepatitis order panel code for a group of hepatitis antibody related tests, or the organism code for a group of antibiotic isolate/sensitivities, or a set of perinatal measurements on a single fetus.

## Notes:

* If the diagnostic procedure was performed on the patient directly, *diagnostic[x]* is a dateTime, the time it was performed. If specimens were taken, the diagnostically relevant time can be derived from the specimen collection times, but since detailed specimen information is not always available, and nor is the diagnostically relevant time always exactly the specimen collection time (e.g. complex timed tests), the reports SHALL always include a *diagnostic[x]* element. Note that v2 messages often carry a diagnostically relevant time without carrying any specimen information.
* A report always contains the name of the report itself. The report can also contain a set of observations, which can themselves be simple observations (e.g. atomic results) or can themselves be groups/panels of other observations. The Observation.name is a code that indicates the nature of the observation or panel (e.g. individual measure, organism isolate/sensitivity or antibody functional testing). When relevant, the observation can specify a particular specimen from which the result comes.
* There is rarely a need for more than two levels of nesting in the Observation tree. One known use is for organism sensitivities - see [this example](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\diagnosticreport-micro1.html).
* Applications consuming diagnostic reports must take careful note of updated (revised) reports, and ensure that retracted reports are appropriately handled.
* For applications providing diagnostic reports, a report should not be final until all the individual data items reported with it are final or amended. If a report is retracted, all the results should be retracted by replacing every result value with the Concept "withdrawn" in the internal terminology ["Special values"](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\valueset-special-values.html) (url = "http://hl7.org/fhir/special-values"), and setting the conclusion (if provided) and the text narrative to some text like "This report has been withdrawn" in the appropriate language. A reason for retraction may be provided in the narrative.
* ImagingStudy and ImageObjectStudy and the image element are somewhat overlapping - typically, the list of image references in the image element will also be found in one of the imaging study resources. However each caters to different types of displays for different types of purposes. Neither, either, or both may be provided.

### Report Content

This resource provides for 3 different ways of presenting the Diagnostic Report:

* As atomic data items: a hierarchical set of nested references to Observation resources often including pathologist/radiologist interpretation(s), one or more images, and possibly with a conclusion and/or one or more coded diagnoses
* As narrative: an XHTML presentation in the standard resource narrative
* As a "presented form": A rich text representation of the report - typically a PDF

Note that the conclusion and the coded diagnoses are part of the atomic data, and SHOULD be duplicated in the narrative and in the presented form if the latter is present. The narrative and the presented form serve the same function: a representation of the report for a human. The presented form is included since diagnostic service reports often contain presentation features that are not easy to reproduce in the HTML narrative. Whether or not the presented form is included, the narrative must be a clinically safe view of the diagnostic report; at a minimum, this could be fulfilled by a note indicating that the narrative is not proper representation of the report, and that the presented form must be used, or a generated view from the atomic data. However consumers of the report will best be served if the narrative contains clinically relevant data from the form. Commonly, the following patterns are used:

* Simple Laboratory Reports: A single set of atomic observations, and a tabular presentation in narrative. Typically this is encountered in high volume areas such as Biochemistry and Hematology
* Histopathology Report: A document report in a presented form and the narrative. Possibly a few key images, and some coded diagnoses for registries. If the service is creating a structured report, some atomic data may be included
* imaging Report; A document report in a presented form and the narrative, with an imaging study reference and possibly some key images. Some imaging reports such as a Bone Density Scan may include some atomic data

Note that the nature of reports from the various disciplines that provide diagnostic reports are changing quickly, as expert systems provide improved narrative reporting in high volume reports, structured reporting brings additional data to areas that have classically been narrative based, and the nature of the imaging and laboratory procedures are merging. As a consequence the patterns described above are only examples of how a diagnostic report can be used.

# source\nutritionorder\nutritionorder-examples-header.xml

# source\nutritionorder\nutritionorder-introduction.xml

## Scope and Usage

The NutritionOrder resource describes a request for oral diets (including general diets such as General Healthy diet, or therapeutic diets such as Consistent Carbohydrate, 2 gram Sodium, or Fluid Restricted), oral nutrition supplements (such as nutritionally complete pre-packed drinks), enteral nutrition (tube feedings) and infant formula which govern the distribution of food and nutritional products used to feed patients within an in-patient setting. It does not cover orders for parenteral (IV) nutrition which are typically filled by pharmacy. These nutrition orders are combined with information on a patient's food allergies and intolerances, and ethnic or cultural food preferences (e.g. Kosher or Vegetarian) to inform healthcare personnel about the type, texture, and/or quantity of foods that the patient should receive or consume.

Enteral orders are distinguished from supplements because they have some unique attributes and typically include administration information whereas oral nutritional supplements may simply be supplied (e.g. home health or outpatient settings). In a simple case, the requestor may designate type of product, product name and the route of administration along with free text instructions without a having to complete the additional structured details.

This resource is intended to be used by providers from a variety of specialties such as physicians, dietitian/nutritionists, or speech therapists. One provider may simply order a base element oral diet such as General Healthful diet. Another provider, based on scope of practice, may use other elements to communicate additional therapeutic needs or patient preferences. The optionality included gives an ordering provider the capability to write a simple order for an oral diet, nutritional supplement or formula with minimal requirements beyond that of specifying the diet, supplement or formula product, but also supports the ability to provide more detailed information that may be further augmented by a dietitian or nutrition specialist. For example, a physician may order a 2 g sodium diet. A speech therapist, based on the results of a swallowing evaluation, then orders a mechanically altered texture with nectar thick liquids.

## Boundaries and Relationships

The NutritionOrder resource is used for requesting oral diets, oral nutrition supplements and enteral feedings in an in-patient setting. The [MedicationOrder](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\medicationorder.html) resource should be used for requesting parenteral (IV) nutrition and prescribing dietary supplements such as vitamin or mineral supplements.

The Nutrition Order is a record of the request for the supply of a diet, oral supplement or enteral formulas for a patient. However, to initiate the request requires the use of the [Order](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\order.html) resource and its associated workflow with the Nutrition Order referenced from the Order.details, or by using the Nutrition Order resource in the context of a messaging or service workflow where the request is explicit or implicit.

# source\nutritionorder\nutritionorder-notes.xml

## Notes:

### Enteral continuous vs. intermittent tube feedings

Tube feedings can be administered via continuous drip using a pump or via intermittent feedings, using gravity drip or a pump. The examples [Nutrition Order Enteral Bolus Feeding Example](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\nutritionorder-example-enteralbolus.html) and [Nutrition Order Enteral Continuous Feeding Example](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\nutritionorder-example-enteralcontinuous.html) show how this resource can be used to order both kinds of enteral feeding using the structured data elements. The continuous feeding typically specifies rate of administration and a maximum volume of delivery using the enteralFormula.rate and enteralFormula.maxVolumeToDeliver elements. On the other hand, the intermittent feeding typically specifies the amount and frequency of administration using the enteralFormula.quantity and enteralFormula.schedule elements. In both cases, to vary the rate or quantity over time the enteralFormula.administration element can be repeated.

### Note about the examples

The examples associated with this resource demonstrate the core elements and do not necessarily reflect real world implementations that may be constrained by future profiles for a given implementation or setting. For example, a renal diet is often comprised of pre-coordinated components including common nutrient modifications such as protein, potassium and phosphorus to assist with the speed of entry of complex diet orders.

# source\observation\observation-device-metric-profile-introduction.xml

### Scope and Usage

The DeviceMetricObservation profile describes the direct or derived, qualitative or quantitative physiological measurement, setting, or calculation data produced by a medical device or a device component.

# source\observation\observation-device-metric-profile-notes.xml

For the initial scope, this DeviceMetricObservation profile is only applicable to describe a measurement that is produced by any medical device that implements or derives from the ISO/IEEE 11073 standard.

# source\observation\observation-examples-header.xml

# source\observation\observation-genetics-introduction.xml

### Overview

Observation-genetics-profile (i.e. Standard Profile for Genetics) extends [Observation](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\observation.html) resource to enable reporting of structured genetic test results. In addition, the genetics profile contextualizes well established standards from the field of clinical genetics into the standards of healthcare (e.g. HGNC - HUGO Gene Nomenclature Committee's international standard for gene names, symbols, and identifiers).

#### Genetic Standards and Resources include:

* Variant Databases: [dbSNP](http://www.ncbi.nlm.nih.gov/projects/SNP/snp_ref.cgi) , [ClinVar](http://www.ncbi.nlm.nih.gov/clinvar/), and [COSMIC](http://cancer.sanger.ac.uk/cosmic/)
* Reference Sequences: [RefSeq](http://www.ncbi.nlm.nih.gov/refseq/) and [ENSEMBL](http://www.ensembl.org/index.html)
* Gene Symbols and Identifiers: [HGNC](http://www.genenames.org) - Human Genee Nomenclature Committee
* Variant Nomenclature: [HGVS](http://www.hgvs.org) nomenclature from the Human Genome Variantion Society
* Variant Feature Annotation: [Sequence Ontology (SO)](http://www.sequenceontology.org) and [LOINC](https://loinc.org)
* Locus: [Gene](http://www.ncbi.nlm.nih.gov/gene)

### Scope and Usage

The Standard Profile for Genetics supports reporting of a DNA variant at the genomic, cDNA, and protein change level. In addition, a condition context may be provided, as AssessedCondition. For large genomic tests, a condition may be used as an input into the analytic pipeline to aid in the identification of clinically relevant variants related to the test order. It is strongly encouraged to provide all available information in this profile for any reported variants, because receiving systems (e.g. discovery research, outcomes analysis, and public health reporting) may use this information to normalize variants over time or across sources. However, these data should not be used to dynamically correct/change variant representations for clinical use outside of the laboratory, due to insufficient information.

Implementers should be aware that semantic equivalency of results of genetic variants cannot be guaranteed unless there is an agreed upon standard between sending and receiving systems.

These challenges raised above are discussed in the HL7 Clinical Sequencing Domain Analysis Model (passed January 2015 ballot and in process of being published).

Hl7 Clinical Genomics Work Group emphasizes the importance of transmitting structured genetic findings within the clinical, translational, and research environments fully integrated with other clinical data, in order to drive outcomes analysis, operational decision making, discovery research, and public health reporting. The standard doesn't currently cover the reporting of clinically relevant negative or wild type results within genetic data portion of the message.

[Here](https://www.hl7.org/documentcenter/public_temp_65DE7F6D-1C23-BA17-0CB30D7343EDE16D/wg/clingenomics/docs/V3DAM_CG_CLINSEQ_R1_O1_2013JAN.pdf) is the document of HL7 Version 3 Domain Analysis Model where the examples used in genetics profile are from (Page 5).

### Component

Observation.component should be used in genetic profile for observations without sequence information while Observation.extension still be used for sequence information as component is only suitable for flat observations.

Here is a LOINC panel that could be supported by Observation.component for example:

**55232-3 Genetic analysis summary panel Â­ Blood or Tissue by Molecular genetics method**

* 51967Â­8 Genetic disease assessed [Identifier] in Blood or Tissue by Molecular genetics method
* 51963Â­7 Medication assessed [Identifier] in Blood or Tissue by Molecular genetics method
* 53039Â­4 Genetic disease analysis overall carrier interpretation [interpretation] in Blood or Tissue by Molecular genetics method
* 51964Â­5 Drug efficacy analysis overall interpretation [interpretation] in Blood or Tissue by Molecular genetics method
* 51971Â­0 Drug metabolism analysis overall interpretation [interpretation] in Blood or Tissue by Molecular genetics method
* 51969Â­4 Genetic analysis summary report in Blood or Tissue Document by Molecular genetics method
* 53577Â­3 Reason for study additional note [Text] in Blood or Tissue by Molecular genetics method Narrative

The usage of component is shown in example3-mutationlist-1/2/3/4.

### Category

Extensions added in genetics profile can be grouped into 4 categories:

* **Sequence Information:** geneticsGenomeBuild, geneticsChromosome, geneticsGenomicStart, geneticsGenomicStop, geneticsReferenceAllele, geneticsObservedAllele, geneticsTranscriptReferenceSequenceId, geneticsProteinReferenceSequenceId, geneticsCIGAR
* **Variation:** geneticsDNASequenceVariation, geneticsVariationId, geneticsDNASequenceVariationType, geneticsAminoAcidChange, geneticsAminoAcidChangeType
* **Context:** geneticsGene, geneticsDNARegionName, geneticsAlleleName, geneticsGenomicSourceClass, geneticsAminoSpecies, geneticsResult
* **State:** geneticsAllelicState, geneticsAllelicFrequency, geneticsCopyNumberEvent, geneticsReadCoverage

# source\observation\observation-introduction.xml

## Scope and Usage

Observations are a central element in healthcare, used to support diagnosis, monitor progress, determine baselines and patterns and even capture demographic characteristics. Most observations are simple name/value pair assertions with some metadata, but some observations group other observations together logically, or even are multi-component observations. Note that the [DiagnosticReport](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\diagnosticreport.html) resource provides a clinical or workflow context for a set of observations. Expected uses for the Observation resource include:

* Vital signs: temperature, blood pressure, respiration rate
* Laboratory Data
* Imaging results like bone density or fetal measurements
* Devices Measurements such as EKG data or Pulse Oximetry data
* Clinical assessment tools such as APGAR
* Personal characteristics: height, weight, eye-color
* Social history: tobacco use, family supports, cognitive status
* Core characteristics: pregnancy status, death assertion

Normally, an observation will have either a value (e.g. a blood glucose measurement) or a set of related observations ( e.g. an electrolyte panel) and not both. A few observations (e.g. Apgar store) may have both a value and related observations (for Apgar, a numeric total score and the five variables whose scores are tallied to derive the total score).

## Boundaries and Relationships

In contrast to the Observation resource, the [DiagnosticReport](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\diagnosticreport.html) resource typically includes additional clinical context and some mix of atomic results, images, imaging reports, textual and coded interpretation, and formatted representations. Laboratory reports, pathology reports, and imaging reports should be represented using the DiagnosticReport resource. The Observation resource is referenced by the DiagnosticReport to provide the atomic results for a particular investigation.

The Observation resources should not be used to record diagnosis or clinical assessments about a patient or subject that are typically captured in the [Condition](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\condition.html) resource or the [ClinicalImpression resource](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\clinicalimpression.html). However, the Observation resource is often referenced by the Condition resource to provide specific subjective and objective data to support its assertions. There are other resources that can be considered "specializations" of the Observation resource and should be used for those specific contexts and use cases. They include [AllergyIntolerance](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\allergyintolerance.html) resource, [FamilyMemberHistory](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\familymemberhistory.html) resource, [Procedure](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\procedure.html) resource, and [Questionnaire](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\questionnaire.html) resource.

In some cases, such as when source data is coming from a v2 feed, a system may not have information that allows it to distinguish diagnosis, allergy and other "specialized" types of observations from lab, vital sign and other observation types intended to be conveyed with this resource. In those circumstances, such specialized observations may also appear using this resource.

# source\observation\observation-notes.xml

## Notes:

At its simplest, a resource instances can consist of only a code and a value, and status flag. The relevance of other properties will vary based on the type of observation.

[Profiles](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\observation-profiles.html) will be created to provide guidance on capturing certain types of simple observations. This resource focuses on the level of detail captured by most systems. However, any "simple" observation can easily be broken into numerous components and sub-components to provide additional information relevant in certain circumstances. As with other resources, [extensionst](file:///C:\\Users\\Lloyd\\Documents\\SVN\\FHIR\\build\\qa\\extensibility.html) can be used to introduce this additional complexity.

### Grouping of Observations

Many observations have important relationships to other observations and need to be assembled in groups together (traditionally referred to as "panels" or " batteries" by laboratories) that can be used to represent relationships between the individual data items. Typically this is done referencing the individual observations in the [DiagnosticReport](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\diagnosticreport.html#4.21.2) resource where the DiagnosticReport.code names the panel and serves as the grouping element. Several [examples](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\diagnosticreport-examples.html) demonstrate observation grouping using DiagnosticReport as the grouper.

The Observation resource has two structures for grouping observations which allow for grouping and even complex nesting of results. The Observation resource can contain a simple observations (e.g. atomic results) or can itself be a groups/panels of other observations.

Frist, panels can be assembled as separate resources referenced using the Observation.related element with a defined relationship type. This approach should be used when the attributes within the resource for each observation are different and/or each panel result exists or needs to be processed as independent FHIR resource ( i.e. - they "stand alone"). The Observation.related element defines the grouping of observations into a panel/battery in this case. The Observation.code names the panel but typically does not have its own Observation.value and the set of member observations for a panel or battery are listed in the Observation.related element. This structure also permits further nesting of groups (panel of panels). For example, a bacterial cultures with susceptibility testing can use this structure for grouping, because a panel for susceptibility tests (one for each bacterium isolated) would be linked as panel to the observation about each organism isolated. The [example of a complex Micro Isolate and Sensitivies report](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\diagnosticreport-micro1.html) demonstrates this.

Assessment tools such as an Apgar or Glasgow score have both a value and related observations or answers from which a final score or value is derived and may be grouped as a set of observations using the Observation.related structure. For example, the [Glasgow coma score example](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\observation-example-glasgow.html) is structured like a panel with 3 related observations (related type ='derived-from') that measure the status of a given aspect of the patients neurologic status. These are added together to get Glasgow Coma Score value.

Secondly panels can be grouped via the component structure, if the panel members share the same attributes and are not separable observations (i.e - they don't "stand alone") or don't need to be processed independently, then the Observation.component element may be used to group them within a single resource. As is true when using Observation.related above, the observation for a panel that carries the component typically does not have its own Observation.value. For example, one might group systolic and diastolic blood pressure within a [Blood Pressure Panel](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\observation-example-bloodpressure.html) using Observation.component because the two are almost always produced together. The [GFR example](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\observation-example-f205-egfr.html) demonstrate another example grouping of observations using Observation.component to tie together the race based estimates of Glomular filtration based upon a serum creatinine measurement.

Grouping via components should be used judiciously because what is available to group can vary widely with the source and the idea of what to group together is often highly contextual and based upon the end user's point of view.

### Value[x] and Datatypes

* The element, Observation.value[x], has a variable name depending on the type as follows:
  + valueQuantity
  + valueCodeableConcept
  + valueString
  + valueRange
  + valueRatio
  + valueSampledData
  + valueAttachment
  + valueTime
  + valueDateTime
  + valuePeriod
* If the data element is usually coded or if the type associated with the Observation.code defines a coded value, use CodeableConcept instead of string data type even if the value is un-coded text. For example the LOINC 43304-5 *Chlamydia trachomatis rRNA [Presence] in Unspecified specimen by Probe and target amplification method* is typically associated with coded presence/absence concepts. Using the coded value for 'negative' wtih a standard code translation the Observation.valueCodeableConcept would be:
* "valueCodeableConcept": {
* "coding": [
* {
* "system": "http://snomed.info/sct",
* "code": "260385009",
* "display": "Negative"
* },
* {
* "system": "urn:oid:2.16.840.1.113883.3.72.5.24",
* "code": "NEG",
* "display": "Negative"
* }
* ],
* "text": "Negative for Chlamydia Trachomatis rRNA"
* }

Using text only, the Observation.valueCodeableConcept the would be:

"valueCodeableConcept": {

"text": "Negative for Chlamydia Trachomatis rRNA"

}

* A value set is bound to the ValueCodeableConcept element. For example In the USLab Observation Profile this element is bound to [USlab Coded Results](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\uslab\valueset-uslab-obs-codedresults.html) which is composed of several SNOMED CT hierarchies. The source system may also provide there own ("local") coded result values as well. Hence coded results are often coded in multiple value sets based on different code systems and these may be mapped using the ConceptMap resource and/or given as translations directly in the element as shown in the example above.
* The Boolean data type is rarely used for Observation.value[x] because most observations result values are never truly Boolean due to exceptional values such as "unknown". If needed, use valueCodeableConcept for Boolean concept instead and select codes from HL7 Version 2 Table 0136 [HL7 Version 2 Table 0136](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\v2\0136\index.html). These "yes/no" concepts can be mapped to the display name "true/false" or other mutually exclusive terms that may be needed.
* The special values "E" (error), "L" (below detection limit) and "U" (above detection limit) can be used are in the SampledData data type. However when using valueQuantity in an observation for above and below detection limit values, valueQuantity should be used by stating the limit along with the comparator. In addition, when there is an error the dataAbsentReason element should be used with the appropriate value ( 'error' or "NaN"). For example if the value was below the lower limit of detection of <2.0 mmol/L the Observation.valueQuantity would be:
* "valueQuantity": {
* "value": 2.0,
* "comparator" : "<",
* "unit": "mmol/l",
* "system": "http://unitsofmeasure.org",
* "code": "mmol/L"
* }

If the value was "NaN" (i.e. an error) the Observation.valueCodeableConcept would be absent and Observation.dataAbsentReason would be:

"dataAbsentReason": {

"coding": [

{

"system": "http://hl7.org/fhir/data-absent-reason",

"code": "NaN",

"display": "Not a Number"

}

* Because there are multiple types allowed for the *value* element, multiple value search parameters are defined. There is no standard parameter for searching values of type Attachment, or Ratio

### Physiologically Relevant Time of the Observation

The appliesDateTime or appliesPeriod is the time that the observation is most relevant as an observation of the subject. For a biological subject (e.g. a human patient), this is the physiologically relevant time of the observation. In the case of an observation using a specimen, this represents the start and end of the specimen collection (e.g. 24 hour Urine Sodium), but if the collection time is sufficiently short, this is reported as a point in time value (e.g. normal venipuncture). In the case of an observation obtained directly from a subject (e.g., BP, Chest X-ray), this is the start and end time of the observation process, which again, is often reported as a single point in time.

### Reference Range

Most commonly observations will only have one generic reference range. Reference ranges may be useful for lab tests and other measures like systolic blood pressure, but will have little relevance for something like "pregnancy status". Systems MAY choose to restrict to only supplying the relevant reference range based on knowledge about the patient (e.g. specific to the patient's age, gender, weight and other factors), but this may not be possible or appropriate. Whenever more than one reference range is supplied, the differences between them SHOULD be provided in the reference range and/or age properties.

### Cancelled or Aborted Observations

If a measurement or test could not be completed, (for example if the specimen is unsatisfactory or the provider cancelled the order) then the status value should be updated to "cancelled" and the specific details given - preferably as coded values - in dataabsentreason or valueCodeableConcept. Additional information may provided in comments as well. The [specimen reject example](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\observation-example-unsat.html) demonstrates this using a coded value for unsatisfactory specimen in dataabsentreason.

# source\specimen\specimen-examples-header.xml

# source\specimen\specimen-introduction.xml

## Scope and Usage

Any material sample:

* taken from a biological entity, living or dead
* taken from a physical object or the environment

Some specimens are biological and can contain one or more components including but not limited to cellular molecules, cells, tissues, organs, body fluids, embryos, and body excretory products (source: [NCI Thesaurus](http://ncit.nci.nih.gov/), modified).

The specimen resource covers substances used for diagnostic and environmental testing. The focus of the specimen resource is the process for gathering, maintaining and processing the specimen as well as where the specimen originated. This is distinct from the use of Substance which is only used when these other aspects are not relevant.

## Background and Context

The current definition of the specimen resource contains only basic information about specimen containers. It does not address the recursive nature of containers or the tracking of the location of a container within its parent container (for instance: a tube in a tray in a rack in a freezer). The frequency with which these elements are tracked may depend on the context of use; general lab; bio-banking, etc. Comments from reviewers on the appropriate scope for this resource, and the need for tracking related specimen management attributes, are welcomed.

# source\specimen\specimen-notes.xml

# source\substance\substance-examples-header.xml

# source\substance\substance-introduction.xml

## Scope and Usage

This resource allows for a material to be represented. The resource can be used to represent either a kind of a substance - e.g. a formulation commonly used for treating patients, or it can be used to describe a particular package of a known substance (e.g. bottle, jar, packet).

The composition of the material can be specified in terms of a mix of other materials, including with precise amounts if required.

## Boundaries and Relationships

A medication is a substance that is packaged and used as an administered medication. The [medication resource](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\medication.html) uses the substance resource to represent the actual ingredients of a medication.

# source\substance\substance-notes.xml

# source\appointment\appointment-examples-header.xml

# source\appointment\appointment-introduction.xml

## Scope and Usage

Appointment resources are used to provide information about a planned meeting that may be in the future or past. The resource only describes a single meeting, a series of repeating visits would require multiple appointment resources be created for each instance. Examples include a scheduled surgery, a follow-up for a clinical visit, a scheduled conference call between clinicians to discuss a case, the reservation of a piece of diagnostic equipment for a particular use, etc. The visit scheduled by an appointment may be in person or remote (by phone, video conference, etc.) All that matters is that the time and usage of one or more individuals, locations and/or pieces of equipment is being fully or partially reserved for a designated period of time.

This definition takes the concepts of appointments in a clinical setting and also extends them to be relevant in the community healthcare space, and also ease exposure to other appointment / calendar standards widely used outside of healthcare.

### The basic workflow to create an appointment

* **Discovery/Addressing**

Before an appointment can be made the address/endpoint details of the resource that we want to schedule an appointment with must be determined. This is often based on the healthcare Service Type, any formatting information which indicates how to make the request. This is typically handled via the Schedule resource.

* **Checking Availability on the Schedule(optional)**

This optional step permits the checking of any existing available times ([slot](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\slot.html) resources associated with a selected [schedule](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\schedule.html)) that can be booked against. Just because a time is indicated it is available doesn't guarantee that an appointment can be made. The booking system that is going to process the request may make other qualifying decisions to determine if the appointment can be made, such as permissions, assessments, availability of other resources etc.

This step is optional as the creation of the appointment is never a guaranteed action. But by performing this availability check, you can increase the chances of making a successful booking.

* **Making the Appointment Request**

When an appointment is required, a Requester creates new Appointment resource with the Appointment.status=â€proposedâ€.  
All included participants (optional or mandatory) should have the status=â€needs-actionâ€ to allow filtering and displaying appointments to user-participants for accepting or rejecting new and updated requests. Based on internal system business rules, certain statuses may be automatically updated, for example: â€œreject because the requested participant is on vacationâ€ or â€œthis type of users is not allowed to request those specific appointments.

* **Replying to the request**

The reply process is simply performed by the person/system handing the requests updating the Participant Statuses as needed. If there are multiple systems involved, then these will create AppointmentResponse entries with the desired statuses.

Once all participants have their participation status created/updated (and the main system marking the appointment participant records with the AppointmentResponse statuses) then the overall status of the appointment is updated.

* **Checking the overall status (Requester)**

The Requester (organizer) of the appointment checks for the overall status of the appointment (and appointmentresponses where applicable) using FHIR pub-sub techniques.

Where the participant statuses indicate that a re-scheduling is required, then the process may start again, with other systems replying to a new set of times.

### There are 2 typical workflows that occur with appointments

* **Outlook Style - Community**

These types of requests are typically handled by selecting a specific time from a list of available slots. Then making the request for that timeslot.

* **Hospital Scheduling - Clinical**

Clinical scheduling is often far more complex in its requirements and processing. Often this involves checking multiple availabilities across multiple systems and timing with other internal systems, not just those exposed by the Slot resources.

Consideration should be given to situations where scheduling needs to be handled in more of a queue-like process.

Note: This type of clinical appointment scheduling has not been specifically covered with this definition of the appointment (and the related resources), however if you would like to contribute to the modification of this resource to cover these use cases, please contact the HL7 Patient Administration work-group.

## Boundaries and Relationships

### Appointment Request/Response Pattern

When using a request response style of appointment this is done using Appointment and AppointmentResponse resources.  
The request is made in the form of an Appointment with a proposed or pending status, and the list of actors with a participation status of "needs-action".

Participants in the appointment respond their acceptance (or not) to the appointment by creating AppointmentResponse resources.  
Once all the participants have replied, then the appointment resource is able to be updated with an overall status which collates the results of all the participants and presents the approved details of the appointment.

The participant type property can be used to represent a specific role that a practitioner is required to perform for the appointment. This could be specified without an actor when the actual practitioner is not known, and will be filled in closer to the scheduled time.  
This property must be the same between the Appointment-participant and the AppointmentResponse so that the appropriate values can be allocated. If you need multiple actors of a specific type, then multiple participants with that type value are included on the appointment.

### Appointment Statuses and Encounters

Appointments can be considered as Administrative only, and the Encounter is expected to have Clinical implications.

In general it is expected that appointments will result in the creation of an Encounter. The encounter is typically created when the service starts, not when the patient arrives. When the patient arrives, an appointment can be marked with a status of Arrived.

In an Emergency Room context, this appointment resource is probably not appropriate to be used. In these cases an encounter should be created.

The Appointment request pattern used is different to the order-response pattern used elsewhere in FHIR.  
This is due to the close relationship to the iCAL standard. Many non-clinical systems use generic non health appointment systems which implement this standard, and the desire to integrate with the consumer who has no access to health based software is highly desirable.  
The mappings to the iCAL standard have been provided to guide implementation of gateways between FHIR servers and iCAL systems.

### Appointment Locations and Participation

The Location of the appointment is to be defined by using a participant that references a location or HealthcareService.  
This permits the location to also have its availability checked via a schedule and any conflicts more easily managed.

# source\appointment\appointment-notes.xml

## Typical Status Transition Examples:

### Typical Flow of statuses for an appointment:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Activity Description** | **Slot** | **Appointment** | **Appointment Response** | **Encounter** |
| The Schedule is created/published  (Role: Scheduler) | freeBusyType = FREE |  |  |  |
| An appointment request is created after locating an available slot  (Role: Requester) |  | status = pending participant.status = needs-action |  |  |
| The appointment request is processed and the slot status updated (Role: Scheduler) | freeBusyType = BUSY-TENTATIVE |  |  |  |
| The appointment is accepted as described â€“ by all participants  (Role: Participant(s)) |  |  | participantStatus = accepted |  |
| The appointment is confirmed as accepted by all participants (Role: Scheduler) | freeBusyType = BUSY | status = booked participant.status = accepted |  |  |
| *Optional: Preparation for the appointment begins â€“ could be preparing a room for the appointment etc. (Role: Participants/Admin)* |  |  |  | status = planned (optional) location.status = planned |
| The patient arrives for the appointment, often sitting in a waiting room (Role: Admin) |  | status = arrived |  | status = arrived location.status = present |
| The practitioner and the patient meet and the provision of the service begins, appointment is finished with now  (Role: Scheduler/Participant(s)/Admin) |  | status = fulfilled |  | status = in-progress |
| The encounter concludes (Role: Scheduler/Participant(s)/Admin) |  |  |  | status = finished |

### Flow for the rejection/cancellation of an appointment

|  |  |  |  |
| --- | --- | --- | --- |
| **Activity Description** | **Slot** | **Appointment** | **Appointment Response** |
| The Schedule is created/published  (Role: Scheduler) | freeBusyType = FREE |  |  |
| Appointment Request is created (Role: Requester) |  | status = pending participant.status = needs-action |  |
| The appointment request is processed and the slot status updated (Role: Scheduler) | freeBusyType = BUSY-TENTATIVE |  |  |
| Participant Declines the Appointment (Role: Participant) |  |  | participantStatus = declined |
| The appointment is cancelled (Role: Scheduler) | freeBusyType = FREE | status = cancelled participant.status = declined |  |

### Flow for re-negotiation:

|  |  |  |  |
| --- | --- | --- | --- |
| **Activity Description** | **Slot** | **Appointment** | **Appointment Response** |
| The Schedule is created/published  (Role: Scheduler) | freeBusyType = FREE |  |  |
| An appointment is requested with Brian and Peter (Role: Requester) |  | status = proposed participant(Brian).status = needs-action participant(Peter).status = needs-action |  |
| The Schedule is updated to inform others of interest in the slot (Role: Scheduler) | freeBusyType = BUSY-TENTATIVE |  |  |
| Brian accepts the appointment (Role: Participant-Brian) |  |  | (Brian).participantStatus = accepted |
| Appointment is updated with Brian's status (Role: Scheduler) |  | status = pending participant(Brian).status = accepted |  |
| Peter suggests a new time (Role: Participant-Peter) |  |  | (Peter).participantStatus = tentative *(with new time)* |
| Appointment is updated with new time, and indicates that action is needed by both participants (Role: Scheduler) |  | *(new time details updated)* participant(Brian).status = needs-action participant(Peter).status = needs-action |  |
| Brian accepts the appointment (Role: Participant-Brian) |  |  | (Brian).participantStatus = accepted |
| Appointment updated (Role: Scheduler) |  | participant(Brian).status = accepted |  |
| (Role: Participant-Peter) |  |  | (Peter).participantStatus = accepted |
| Appointment updated (Role: Scheduler) | freeBusyType = BUSY | status = booked participant(Peter).status = accepted |  |

### Flow for a patient no-show:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Activity Description** | **Slot** | **Appointment** | **Appointment Response** | **Encounter** |
| *(from typical status flow)* | freeBusyType = BUSY | status = booked participant.status = accepted |  |  |
| Appointment is updated as a noshow (Role: Scheduler/Admin) |  | status = noshow |  | *(no encounter created)* |

## Notes:

* Placer/Filler (HL7 v2)

The appointment information is effectively the same between the filler and placer, and given the nature of the fhir resource, there is only a single resource for both purposes. The Placer is the actor that performs the PUT or POST operation on the resource, and the filler is the actor that receives these resource messages and processes the information and makes a decision if the appointment can be used.

* Interaction with other Standards

The strong desire is that implementers of this resource should consider providing this resource in the iCalendar format as an alternative representation. Many 3rd party applications and component providers have parsers and user interface controls to display this information. This may lower the entry point to integrate outside the health-care specific applications, and into the consumer space. This would permit the easier creation of a mobile application that creates appointments in the devices native calendar.  
The iCalendar specification can be found at <http://www.ietf.org/rfc/rfc2445.txt>.

**DSTU Note:** Implementer feedback on is sought on the values for Appointment.priority and how interoperable they are. Using an extension to record a codeableconcept for named values may be tested at a future connectathon.

Feedback [here](http://wiki.hl7.org/index.php?title=FHIR_Specification_Feedback_(DSTU_2)).

# source\appointmentresponse\appointmentresponse-examples-header.xml

# source\appointmentresponse\appointmentresponse-introduction.xml

## Scope and Usage

Appointment resources are used to provide information about a planned meeting that may be in the future or past. They may be for a single meeting or for a series of repeating visits. Examples include a scheduled surgery, a follow-up for a clinical visit, a scheduled conference call between clinicians to discuss a case, the reservation of a piece of diagnostic equipment for a particular use, etc. The visit scheduled by an appointment may be in person or remote (by phone, video conference, etc.) All that matters is that the time and usage of one or more individuals, locations and/or pieces of equipment is being fully or partially reserved for a designated period of time.

This definition takes the concepts of appointments in a clinical setting and also extends them to be relevant in the community healthcare space, and also ease exposure to other appointment / calendar standards widely used outside of Healthcare.

# source\appointmentresponse\appointmentresponse-notes.xml

## Notes:

* Time zones and Recurring Appointments

Recurring appointments need to have the time zone in which the values were entered in defined. Knowing that the start time was at 9:00:00Z+10 does not mean that the same time in 2 weeks is actually the same.

As if this was a time in Brisbane Australia, this time will be the same (in respect to its offset from UTC), however if this was for Melbourne Australia, during the daylight savings period of time Melbourne becomes +11. So without the additional information as to which time zone it was created in, scheduling a 9am appointment every Wednesday would not be possible.

* Placer/Filler (HL7 v2)

The appointment information is effectively the same between the filler and placer, and given the nature of the fhir resource, there is only a single resource for both purposes. The Placer is the actor that performs the PUT or POST operation on the resource, and the filler is the actor that receives these resource messages and processes the information and makes a decision if the appointment can be used. Brian: Does this seem right that the filler and placer are applied in this way?

* Interaction with other Standards

The strong desire is that implementers of this resource should consider providing this resource in the iCalendar format as an alternative representation. Many 3rd party applications and component providers have parsers and user interface controls to display this information. This may lower the entry point to integrate outside the health-care specific applications, and into the consumer space. This would permit the easier creation of a mobile application that creates appointments in the devices native calendar.  
The iCalendar specification can be found at <http://www.ietf.org/rfc/rfc2445.txt>.

# source\encounter\encounter-examples-header.xml

# source\encounter\encounter-introduction.xml

## Scope and Usage

A patient encounter is further characterized by the setting in which it takes place. Amongst them are ambulatory, emergency, home health, inpatient and virtual encounters. An Encounter encompasses the lifecycle from pre-admission, the actual encounter (for ambulatory encounters), and admission, stay and discharge (for inpatient encounters). During the encounter the patient may move from practitioner to practitioner and location to location.

Because of the broad scope of Encounter, not all elements will be relevant in all settings. For this reason, admission/discharge related information is kept in a separate Hospitalization component within Encounter. The *class* element is used to distinguish between these settings, which will guide further validation and application of business rules.

There is also substantial variance from organization to organization (and between jurisdictions and countries) on which business events translate to the start of a new Encounter, or what level of aggregation is used for Encounter. For example, each single visit of a practitioner during a hospitalization may lead to a new instance of Encounter, but depending on local practice and the systems involved, it may well be that this is aggregated to a single instance for a whole hospitalization. Even more aggregation may occur where jurisdictions introduce groups of Encounters for financial or other reasons. Encounters can be aggregated or grouped under other Encounters using the *partOf* element. See [below](#examples) for examples.

Encounter instances may exist before the actual encounter takes place to convey pre-admission information, including using Encounters elements to reflect the planned start date or planned encounter locations. In this case the *status* element is set to 'planned'.

The Hospitalization component is intended to store the extended information relating to a hospitalization event. This is always expected to be the same period as the encounter itself, where this is different then another encounter is entered which captures this information which is a partOf this encounter instance.

### Status Management

During the life-cycle of an encounter it will pass through many statuses. Typically these are in order or the organizations workflow: planned, in-progress, finished/cancelled.  
This status information is often used for other things, and often an analysis of the status history is required. This could be done by scanning through all the versions of the encounter and then checking the period of each, and doing some form of post processing. To ease the burden of this (or where a system doesn't support resource histories) a status history component is included.

There is no direct indication purely by the status field as to if an encounter is considered "admitted".  
The context of the encounter and business practices/policies/workflows/types can influence this definition. (e.g. Acute Care facility, Aged Care Centre, Outpatient Clinic, Emergency Dept, Community Based Clinic)  
Statuses of "arrived" or "in progress" could be considered the start of the admission, and also have the presence of the hospitalization sub-component entered.

The "on leave" status may or may not be a part of the admission, for example if the patient was permitted to go home for a weekend or some other form of external event.  
The location is also likely to be filled in with a location status of "present".  
For other examples such as an outpatient visit (Day Procedure - colonoscopy), the patient could also be considered to be admitted, hence the encounter doesn't have a fixed definition of admitted. At a minimum, we do believe that a patient IS admitted when the status is in-progress.

## Boundaries and Relationships

The Encounter resource is not to be used to store appointment information, the Appointment resource is intended to be used for that. Note that in many systems outpatient encounters (which are in scope for Encounter) and Appointment are used concurrently. In FHIR, Appointment is used for establishing a date for the encounter, while Encounter is applicable to information about the actual Encounter, i.e. the patient showing up.  
As such an encounter in the "planned" status is not identical to the appointment that scheduled it, but it is the encounter prior to its actual occurrence, with the expectation that encounter will be updated as it progresses to completion. Patient arrival at a location does not necessarily mean the start of the encounter (e.g., a patient arrives an hour earlier than he is actually seen by a practitioner).

An appointment is normally used for the planning stage of an appointment, searching, locating an available time, then making the appointment. Once this process is completed and the appointment is about to start, then the appointment will be marked as fulfilled, and linked to the newly created encounter.  
This new encounter may start in an "arrived" status when they are admitted with a location of the facility, and then will move to the ward where another part-of encounter may begin.

Communication resources are used for a direct simultaneous interaction between a practitioner and a patient where there is no direct contact. Such as phone message, or transmission of some correspondence documentation.  
There is no duration recorded for a communication resource, but could contain sent and received times.

Standard Extension: **Associated Encounter**  
This extension should be used to reference an encounter where there is no property that already defines this association on the resource.

# source\encounter\encounter-notes.xml

## Notes

* The *class* element describes the setting (in/outpatient etc.) in which the Encounter took place. Since this is important for interpreting the context of the encounter, choosing the appropriate business rules to enforce and for the management of the process, this element is required.
* In future versions of FHIR, some kind of charge posting vehicle (e.g. Account) will be added.

## Example usage

As stated, Encounter allows a flexible nesting of Encounters using the partOf element. For example:

* A patient is admitted for two weeks - This could be modeled using a single Encounter instance, in which the start and length are given for the duration of the whole stay. The admitting doctor and the responsible doctor during the stay are specified using the Participant component.
* During the encounter, the patient moves from the admitting department to the Intensive Care unit and back - Three more detailed additional Encounters can be created, one for each location in which the patient stayed. Each of these Encounters has a single location (twice the admitting department and once the Intensive Care unit) and one or more participants at that location. These Encounters may use the partOf relationship to indicate these movements occurred during the longer overarching Encounter.
* During the last part of the stay, the patient is visited by the members of the multi-disciplinary team that treated him for final evaluation - If relevant, for each of these short visits, an Encounter may be created with a single participant. Since these took place during the last part of the stay, the partOf element can be used to associate these short visits with either the third patient movement or the bigger overall encounter.

Exactly how the Encounter is used depends on information available in the source system, the relevance of exchange of each level of Encounter and demands specific to the communicating partners. The expectation is that for each domain of exchange, Profiles are used to limit the flexibility of Encounter to meet the demands of the use case.

# source\episodeofcare\episodeofcare-examples-header.xml

# source\episodeofcare\episodeofcare-introduction.xml

## Scope and Usage

The EpisodeOfCare Resource contains information about an association of a Patient with a Healthcare Provider for a period of time under which related healthcare activities may occur.

In many cases, this represents a period of time where the Healthcare Provider has some level of responsibility for the care of the patient regarding a specific condition or problem, even if not currently participating in an encounter.

These resources are typically known in existing systems as:

* EpisodeOfCare: Case, Program, Problem, Episode
* Encounter: Visit, Contact

### Multiple Organizations and Transfer of Care

Many organizations can be involved in an EpisodeOfCare, however each organization will have their own EpisodeOfCare, which tracks their responsibility with the Patient.

When an Organization completes their involvement with the patient and transfers care to another Organization. This is often in the form of a referral to another Organization (or Organizations).

When an incoming referral is received a new EpisodeOfCare may be created for this organization. The initial step(s) in the intake workflow for the referral often involve some form of assessment(s), eligibility, capacity, care levels, which could take some time.  
Once the intake process is completed and the patient is accepted, a CarePlan is often created.

## Boundaries and Relationships

The primary difference between the EpisodeOfCare and the Encounter is that the Encounter records the details of an activity directly relating to the patient, while the EpisodeOfCare is the container that can link a series of Encounters together for problems/issues.  
The Example scenarios below give some good examples as to when you might want to be using an EpisodeOfCare.

This difference is a similar difference between the EpisodeOfCare and a CarePlan. The EpisodeOfCare is a tracking resource, rather than a planning resource.  
The EpisodeOfCare usually exists before the CarePlan. You don't need a CarePlan to use an EpisodeOfCare.

## Background and Context

Systems collect a coherent group of activities (such as encounters) related to a patient's health condition or problem often referred to as a Care Episode. Information about an episode is often shared across systems, and in some cases organizational and disciplinary boundaries. An Episode Of Care contains details about the purpose of the care and can exist without any activities.  
The minimal information that would be required in an episode of care would be a patient, organization and a reason for the ongoing association. Other reasons for creating an EpisodeOfCare could be for tracking the details required for government reporting or billing.

### Expected Implementations

* Chronic Disease Management Systems
* Community Care Systems
  + Tracking progress of a specific condition
  + Tracking government funding
* Problem based General Practice systems
* Disability Support Systems
* Aged Care Systems (Community and Residential)

# source\episodeofcare\episodeofcare-notes.xml

## Status Management

### History and Period

When an Organization assumes responsibility for a patient, then the EpisodeOfCare is created and a start date entered to show when it has begun.  
As the Organizations responsibility changes, as does the status of the EpisodeOfCare.  
This is described via an example below for an example intake workflow.

### Leave Handling

With long term care there is often a concept of the provision of care being suspended for various reasons. Many systems have extensive Leave Management/Tracking solutions which consider the complexities of this space, however this EpisodeOfCare resource is NOT intended to provide this level of tracking.  
Extension(s) may be used on the status/status history to track the on hold reason, which can facilitate the processing.

A more complete Leave Management solution may have to deal with:

* Leave Types
* Leave Entitlements
* Billing/Funding implications while on different types of leave

### Example Intake Workflow

This example sequence demonstrates some status transitions and how other resources interact.  
The context could be in a Community/Aged Care/Disability/Mental Health setting.

* ReferralRequest received
* *intake clerk processes referral and decides that the first level eligibility has been met  
  (e.g. Have capacity in the facility for the patient, the patient is covered by VA)*
* EpisodeOfCare created with status of planned which is allocated as fulfilling the ReferralRequest
* *Further assessment of needs is scheduled to be taken, a care manager is probably allocated at this point*
* Assessment Practitioner sees the Patient and completes a series of relevant Questionnaires to rank the patient
* The assessments are reviewed and a formal CarePlan is created
* The EpisodeOfCare is updated to be marked as active, and the CareTeam is likely filled in
* *The provision of care is then managed through the care plan, with all activities will also being linked to the EpisodeOfCare*
* The patient is admitted to hospital for some procedures, EpisodeOfCare is marked as on hold  
  Some of the services on the CarePlan (or scheduled appointments) would be reviewed to determine if they can be performed without the patient (e.g. Home Maintenance), or if they should be suspended while the patient is on hold.
* The patient returns from the hospital and the EpisodeOfCare is marked as active again (and services reviewed again)
* *Patient wished to move to another area to be closer to family*
* Organization creates an outgoing ReferralRequest to a new Organization to continue the care
* The EpisodeOfCare is closed

In some jurisdictions an Organization may be funded by a government body for the days that a patient is under their care. These are known as "active days". This does not mean that they are actively receiving a service (an encounter), but that the organization is responsible for managing their care.  
This monthly reporting value can be easily extracted from the status history as described above.  
The actual provision of services may also be funded separately, and this would be via the Encounters.

### EpisodeOfCare Outcomes Review

An Organization may perform analytics on their Episodes Of Care to have an understanding of how their business is performing.  
Observing that there was a 60/40 split of episodes being finished/cancelled is not very informative. The organization would prefer to know the reason why the episodes are completing so that they can plan their business effectively.  
Theyâ€™d be more interested in knowing whether it was due to services hitting their mandatory end date, client passing away, client transitioning to a higher level of services provided by them or to another provider etc.

Currently there are no attributes on this resource to provide this information. This would be very specific to each implementation and usage, so it would be recommended to use extensions to achieve this functionality.

## Example Scenarios

A General Practitioner wants to review how well his patient is managing his diabetes over time from information within his clinic and also the regional community care organization's system(s).

The EpisodeOfCare enables the practitioner to easily separate the diabetes activities from the mental health problem's activities.

A Community Care organization wants to track all activities that occur with a patient relating to their disability to simplify the reporting to the government to receive funding to care for the patient

# source\healthcareservice\healthcareservice-examples-header.xml

# source\healthcareservice\healthcareservice-introduction.xml

## Scope and Usage

The HealthcareService resource is used to describe a single healthcare service or category of services that are provided by an organization at a location.  
The location of the services could be virtual, as with TeleMedicine Services.

Common examples of HealthcareServices resources are:

* Allied Health
* Clinical Neuropsychologist
* Podiatry Service
* Smallville Hospital Emergency Services
* Respite care provided at a nursing home or hostel
* 24hr crisis telephone counseling service
* Information, advice and/or referral services; Disability, Telecommunications
* Rural TeleHealth Services
* Hospital in the home
* Yellow Cabs
* Pharmacy
* Active Rehab
* Social Support
* Drug and/or alcohol counseling
* Day Programs, Adult Training & Support Services
* Consulting psychologists and/or psychology services
* Group Hydrotherapy
* Little River Home Maintenance

*HealthcareService resources do not represent Computer related Services (not SOA)*

Example uses of HealthcareService resources are:

* National Services Directory - Consumer Focus
* National Services Directory - Practitioner Referrals Searching
* Organization's Client Portal - to locate services / book appointments
* Address book of services for Referrals  
  *including references to Questionnaires for assessments that are required as part of the referral*
* Health Network internal directory *Used for tracking available services offered internally, and also those offered by business partners.  
  This information may also include costing information.*

## Boundaries and Relationships

The HealthcareService resource can be used with the Schedule resource to define actual availability of the service. This would be done by using the Schedule's Actor property.

When creating an Appointment, the HealthcareService is to be assigned to one of the participants.  
It is up to the scheduling system to determine if the service is available, and can be accepted.

# source\healthcareservice\healthcareservice-notes.xml

## Notes:

* The HealthcareService could be mapped to components of the IHE Care Services Directory, and/or the OMG ServD standards

# source\location\location-examples-header.xml

# source\location\location-introduction.xml

## Scope and Usage

A Location includes both incidental locations (a place which is used for healthcare without prior designation or authorization) and dedicated, formally appointed locations. Locations may be private, public, mobile or fixed and scale from small freezers to full hospital buildings or parking garages.

Examples of Locations are:

* Building, ward, corridor, room or bed
* Mobile Clinic
* Freezer, incubator
* Vehicle or lift
* Home, shed, or a garage
* Road, parking place, a park
* Ambulance (generic)
* Ambulance (specific)
* Patient's Home (generic)
* Jurisdiction

These locations are not intended to cover locations on a patient where something occurred (i.e. a patient's broken leg), but can hapily cover the location where the patient broke the leg (the playground)

## Boundaries and Relationships

Locations and Organizations are very closely related resources and can often be mix/matched/confused.  
The Location is intended to describe the more physical structures managed/operated by an organization, where the Organization is intended to represent the more conceptual hierarchies, such as a ward.

A Location is valid without an address in cases where it could be purely described by a geo-coded location in remote areas, or when recorded by a device. Locations with a mode = "kind" would also likely not have an address, as they are just a type of location, but could also have an address where they can be found at the address.

Another use of location could be for describing a Jurisdiction. This jurisdiction may be considered a classified boundary which could be a combination of a physical boundary, and some other discriminator(s):

* Nation - Country wide community or Federal Government (Ministry of Health)
* Province or State (community or Government)
* Business (throughout an enterprise)
* Business scope (CDC/FDA)
* Business segment (UK Pharmacy)

# source\location\location-notes.xml

## Notes

* Multiple Organizations or Practitioners may provide services at a Location. These references are not kept in Location, but can be found in the models for [Organization](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\organization.html) and [Practitioner](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\practitioner.html) instead.
* Locations may range from whole buildings to cabinets; it is possible to relate smaller Locations to their containing bigger Location using the Location.partOf element.
* Location.position is expressed using the same syntax, datum and reference system as used in Google Earth's KML files, see [Google/OGS's KML](http://www.opengeospatial.org/standards/kml).

### Location Mode

The Location.mode element can be used to indicate whether a Location resource represents a specific (potentially identifiable) Location ('instance'), or a class of Locations ('kind'). Especially Resources capturing orders, resource scheduling, plans and definitions may refer to Locations in 'kind' mode. For these domains, it is often not necessary to refer to a specific Location, but rather to a class of Locations. An example of this is found in planning, where we need to allocate an "isolation room" for a patient, or need to dispatch "an ambulance" at a certain time. In these cases it is not important exactly which isolation room or ambulance is allocated, and it is sufficient to just indicate a 'kind' of Location.

Note that 'kind' should not be used to represent Locations where an actual instance of a Location was involved, but identifying information is missing. E.g. when a patient arrived 'by ambulance', but it is not known by which ambulance, this should be represented using a Location in 'instance' mode with a missing identifier, not a Location of 'kind' ambulance.

Some of Location's data elements are only relevant when mode is 'instance' and should not be used when mode is 'kind':  
*(however this information could still be included if was relevant, such as when it is a generic item, but not globally generic, eg a Burgers MU ambulance)*

* Location.identifier
* Location.telecom
* Location.address
* Location.position
* Location.status
* Location.managingOrganization

## Example Location Hierarchy

An example location hierarchy should help give some guidance as to one example of how a location hierarchy could look within a fictitious Hospital.  
*(The nesting here would be the "part-of" structure of the location)*

Hospital A Building C (instance)

East Wing (instance)

Level 1 (instance)

Reception (instance)

Nurses Station EM-ns1 (instance)

Medication Cupboard A (instance)

Room 1 (instance)

Room 1a (instance) - space in room separatable via a curtain

Bed 1a (instance) - always in this room

Room 1b (instance)

Trolley 43 (instance) - moves about

Room 1d (instance)

Trolley 19 (instance) - moves about

Room 2 (instance)

...

Theatre EM-TA (instance)

Coridor (generic)

Level 2 (instance)

Reception (instance)

...

Nurses Station EM-ns1 (instance)

Medication Cupboard A (instance)

Coridor (generic)

Mobile Services (kind)

Ambulance (kind)

Ambulance AMB1 (instance)

Ambulance AMB2 (instance)

*Note: that Wards/Departments are not part of this structure; these would form part of the Organizational Hierarchy.*

# source\organization\organization-examples-header.xml

# source\organization\organization-introduction.xml

## Scope and Usage

This resource may be used in a shared registry of contact and other information for various organizations or it can be used merely as a support for other resources that need to reference organizations, perhaps as a [document](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\documents.html), [message](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\messaging.html) or as a [contained](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\references.html#contained) resource. If using a registry approach, it's entirely possible for multiple registries to exist, each dealing with different types or levels of organization.

## Boundaries and Relationships

The Organization resource is used for collections of people that have come together to achieve an objective. The [Group](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\group.html) resource is used to identify a collection of people (or animals, devices, etc.) that are gathered for the purpose of analysis or acting upon, but are not expected to act themselves.

The Organization resource often exists as a hierarchy of organization resources, using the *part-of* property to provide the association of the child to its parent organization.  
This organizational hierarchy helps communicate the conceptual structure, where-as the Location resource provides the physical representation of the hierarchy.  
The linkage between Organization and Location is from each point in the location hierarchy to the appropriate level in the Organization hierarchy. These links don't all have to be to the top level Organization.  
When populating the organization and location hierarchies there is often not a clear distinction between these 2, however to assist in making the decision, Locations are always used for recording where a service occurs, and hence where encounters and observations are associated. The Organization property on these resources may not be the location where the service took place.

# source\organization\organization-notes.xml

## Notes:

* There are two places for contact information: one on Organization itself and zero or more using the ContactEntity construct. The first one is to be used for the generic, public organization point of contact. The ContactEntity is to be used for reaching a person or party that has been designated by the organization to be contacted for a specific purpose or goal.

## Example Organization Hierarchy:

An example organization hierarchy should help give some guidance as to one example of how a location hierarchy could look within a fictitious Medical Organization.  
*(The nesting here would be the "part-of" structure of the Organization resource)*

Burgers University Medical Center

Eastern Services (prov)

Emergency Dept

Oncology Dept

Neuclear Medicine Research Trials (edu)

Maternity Ward

Childrens Ward

Day Procedures Unit

Mobile Services (Ambulance)

Research Center (edu)

Neuclear Medicine (edu)

Burgers University (edu)

Neuclear Medicine Faculty (edu)

Undergraduate Medicine (edu)

...

*Note that physical structures of this hierarchy are not present, these are defined by a Location hierarchy.*

# source\patient\patient-examples-header.xml

# source\patient\patient-introduction.xml

## Scope and Usage

This Resource covers data about patients and animals involved in a wide range of health-related activities, including:

* Curative activities
* Psychiatric care
* Social services
* Pregnancy care
* Nursing and assisted living
* Dietary services
* Tracking of personal health and exercise data

The data in the Resource covers the "who" information about the patient: its attributes are focused on the demographic information necessary to support the administrative, financial and logistic procedures. A Patient record is generally created and maintained by each organization providing care for a patient. A patient or animal receiving care at multiple organizations may therefore have its information present in multiple Patient Resources.

Not all concepts are included within the base resource (such as race, ethnicity, organ donor status, nationality etc.) but may be found in [profiles](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\patient-profiles.html) defined for specific jurisdictions (e.g. US Meaningful Use Program), or [standard extensions](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\patient-extensions.html)"  
Such fields vary widely between jurisdictions and often have different names and valuesets for the similar concepts, but they are not similar enough to be able to map and exchange

# source\patient\patient-notes.xml

Notes:

* multipleBirth can be either expressed as a Boolean (just indicating whether the patient is part of a multiple birth) or as an integer, indicating the actual birth order.
* Patient records may only be in one of two statuses: in use (active=true) and not in use (active=false). A normal record is active, i.e. it is in use. Active is set to 'false' when a record is created as a duplicate or in error. A record does not need to be linked to be inactivated.
* The *link* element is used to assert that two or more Patient resources are both about the same actual patient. See below for further discussion
* There should be only one preferred language (Language.preference = true) per mode of expression.
* The Contact for a Patient has an element *organization*, this is for use with guardians or business related contacts where just the organization is relevant.

## Patient id's and Patient resource id's

A Patient record's Resource Id can never change. For this reason the identifiers with which humans are concerned (often called MRN - Medical Record Number, or UR - Unit Record) should not be used for the resource's id, since MRN's may change, i.e. as a result of having duplicate records of the same patient. Instead they should be represented in the *Patient.identifier* list where they can be managed. This is also useful for the case of institutions that have acquired multiple numbers because of mergers of patient record systems over time.

## Linking Patients

The *link* element is used to assert that patient resources refer to the same patient. This element is used to support the following scenarios where multiple patient records exist:

### Duplicate Patient records

Managing Patient registration is a well known difficult problem. Around 2% of registrations are in error, mostly duplicate records. Sometimes the duplicate record is caught fairly quickly and retired before much data is accumulated. In other cases, substantial amounts of data may accumulate. By using a link of type 'replace', the record containing such a link is marked as a duplicate and the link points forward to a record that should be used instead. Note that the record pointed to may in its turn have been identified as created in error and forward to yet another Patient resource. Records that replace another record, do not point back to the replaced record.

### Patient record in a Patient index

A Patient record may be present in a system that acts as a Patient Index: it maintains a (summary of) patient data and a list of one or more servers that it are known to hold a more comprehensive and/or authorative record of the same patient. The link type 'refer' is used denote such a link. Note that linked records may contain contradictory information. The record referred to does not point back to the referring record.

### Distributed Patient record

In a distributed architecture, multiple systems keep separate patient records concerning the same patient. These records are not considered duplicates, but contain a distributed, potentially overlapping view of the patient's data. Each such record may have its own focus or maintaining organization and there need not be a sense of one record being more complete or more authorative than another. In such cases, links of type 'see also' can be used to point to other patient records. It is not a requirement that such links are bilateral.

## Patient vs. Person vs. Patient.Link

The Person resource on the surface appears to be very similar to the Patient resource, and the usage for it is very similar to using the Patient.Link capability.  
The intention of the Person resource is to be able to link instances of resources together that are believed to be the same individual. This includes across resource types, such as RelatedPerson, Practitioner, Patient and even other Person resources.  
The Patient Link however is only intended to be used for Patient resources.

The primary use case for the Person resource is to be able to support Person registries that do not necessarily have a healthcare context, and are able to identify and quantify confidence levels that this is the same person.  
This could include consumer portals where the actual maintainer of the Person information is the actual person themselves.  
A system could use the Person entry to cross check changes to information applied to one part of a record to values in another system. e.g. A Consumer updates his contact numbers and address when moving in his Person record, and then a Patient Administration system is able to see that this data is changed, and prompt the organization to follow up with the patient that was linked to the person record if they want their details updated, or if they no longer need services and they should be cancelled, as they've moved from the area.

## Patient.Contact vs. RelatedPerson

The contact component on the Patient Resource should be used for storing people to contact information. Where a system has a separate record for other people for purposes other than just the contact details, The RelatedPerson resource should be used.  
This includes cases where these related people are actually contributing to the record, and need to be referenced individually (e.g. CarePlan.Participant, Encounter, DocumentReference, Appointment) where the Patient.Contact component cannot be used.

It is not expected that these records will be used for primary care provider; this information should be stored in the Patient.careProvider field.

## Merging records

This specification does not specify merge functionality: if multiple patient records are found to be duplicates, they can be linked together, as described above. These links merely express the relationship between records, and in the case of a replacement link, indicate a "master" record. This specification does not mandate that FHIR servers migrate information between such records on finding such a link. Note:

* Health information administrators may call the process "merging", but it is often implemented as "linking" at the record level
* Servers are allowed to implement merging/record migration even though it is not mandated.

**DSTU Note:** We are seeking input from the implementer community on what effect linking/merging/unlinking should have on other functionality such as the GET operation (where the result is the old version of the Patient), searching, reverse includes etc.  
E.g. should observation resources from all linked/merged patients be returned when querying for one of them?  
How should an unlink behavior be done? (Assuming that no data was "re-allocated" as part of merge) These suggested updated behaviors could be the subject of a future connectathon.

Feedback [here](http://wiki.hl7.org/index.php?title=FHIR_Specification_Feedback_(DSTU_2)).

## Patient Matching using an MPI

A Master Patient Index ([MPI](http://en.wikipedia.org/wiki/Enterprise_master_patient_index)) is a service used to manage patient identification in a context where multiple patient databases exist. Healthcare applications and middleware use the MPI to match patients between the databases, and as new patient details are encountered. MPIs are highly specialized applications, often tailored extensively to the institution's particular mix of patients. MPIs can also be run on a regional and national basis.

To ask an MPI to match a patient, clients use the "MPI" [query](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\search.html#query), which uses the normal search parameters defined for patient. However, rather than their normal use, they are interpreted as MPI inputs - e.g. instead of requiring that the resources literally contain the search parameters, they are passed to an MPI algorithm of some kind that uses them to determine the most appropriate matches in the patient set.

GET [base]/Patient?\_query=mpi&parameters...

The response from an "MPI" query is a set of patient records, ordered from most likely to least likely. If there are not patient matches, the MPI SHALL return an empty search set with no error, but may include an [operation outcome](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\operationoutcome.html) with further advice. All patient records SHALL have a score from 0 to 1, where 1 is the most certain match, along with an [extension](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\extensibility.html) ["patient-mpi-match"](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\extension-patient-mpi-match.html) that indicates the MPI's position on the match quality:

<entry>

<resource>

<Patient>

<!-- patient details -->

</Patient>

</resource>

<search>

<extension url="http://hl7.org/fhir/StructureDefinition/patient-mpi-match">

<valueCode value="probable"/>

</extension>

<score value="0.80"/>

</search>

</entry>

The patient-mpi-match extension has one of the [following codes](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\valueset-patient-mpi-match.html):

[%codelist-nh http://hl7.org/fhir/ValueSet/patient-mpi-match%]

One optional parameter to the MPI match operation is "userid", which is used to pass the user details from a trusted client to the MPI. This may be used by the MPI to restrict the possible matches that are returned based on user's rights. For example, a staff member covered by policies etc may well get a different result than a patient trying to find their own record. Note that this parameter is used where the user would not be expected to log in to the MPI directly; whether this is appropriate or not is a deployment choice.

A [formal definition](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\patient-mpi-search.html) for the MPI query is published.

**DSTU Note:** This is the first draft of this approach, as a result of connectathon testing.

Feedback is sought [here](http://wiki.hl7.org/index.php?title=FHIR_Specification_Feedback_(DSTU_2)).

# source\person\person-examples-header.xml

# source\person\person-introduction.xml

## Scope and Usage

An individual has identity outside of a healthcare setting. The Person resource is used to capture this information and to relate the person as an individual to other resources that do have a health-related context.

For example, while a patient resource may be created and maintained by each organization providing care for that person as a patient, a person resource provides a mechanism for linking patient resources across different organizations and their unique patient identity domains.

This resource is not referenced by any other resources.

# source\person\person-notes.xml

## De-normalized Data

Most of the properties of the Person resource are replicated within the other resources that they are shared with. This is intentional and highlights that the "disconnectedness" of the resources.

Not many systems actually implement a shared Person record, and as such the values DO become out of sync with each other. The inclusion of this resource does permit a capability for systems to identify other instances of this actual person's data via a centralized registry that can assist in keeping things up to date.

## Person and Linking

The *link* element is used to relate resources under a common person record. This element supports two primary scenarios where other resources refer to the same person resource.

The *link* element cannot be used to link to RelatedPerson entries. So we can utilize a Person resource to relate these elements together identifying them as the same individual.

## Cross-Domain Patient Directory

In a data sharing network, finding the location of patient records across different systems is a necessary pre-requisite for accessing external patient data. Using the *link* element, systems associate patient resources from different organizations. The assuranceLevel associated with the *link* provides a way for a system to qualify its confidence in the asserted *link*. For example, a relationship from the person to a patient using a probabilistic matching algorithm may be represented using a *link* with an assurance level of level1, while a relationship established using a government-issued photo ID may be created with an assurance level of level3.

## Cross-Domain Provider Directory

Similarly, providers working in multiple healthcare service settings may be linked across different organizations using the *link* element. The various practitioner resources can be related using a common person resource with a *link* for each of the practitioner resources located in other organizations.

## Client Portal

Client Portals provide consumer access to a window of their data locked up in healthcare systems. In many cases these systems are externally integrated and do not have access to the legacy CIS/PAS systems.

In contrast to most systems where a user has access to multiple patients depending on their roles and permissions, a client portal provides a consumer with direct access to their data (with permissions applied). This can also include not just their data (via the Person.link Patient entries), but also to information that they have entered, or were involved with (via the Person.link RelatedPerson entries), such as observations that they entered.  
With appropriate permissions/consent applied, the user could have access to other Patient records linked via a RelatedPerson.

# source\practitioner\practitioner-examples-header.xml

# source\practitioner\practitioner-introduction.xml

## Scope and Usage

Practitioner covers all individuals who are engaged in the healthcare process and healthcare-related services as part of their formal responsibilities and this Resource is used for attribution of activities and responsibilities to these individuals. Practitioners include (but are not limited to):

* physicians,Â dentists,Â pharmacists
* physician assistants,Â nurses, scribes
* midwives,Â dietitians,Â therapists,Â optometrists, paramedics
* medical technicians,Â laboratory scientists, prosthetic technicians, radiographers
* social workers, professional home careers, official volunteers
* receptionists handling patient registration
* IT personnel merging or unmerging patient records
* Service animal (e.g. Ward assigned dog capable of detecting cancer in patients)

## Boundaries and Relationships

The Resource SHALL NOT be used for persons involved without a formal responsibility like individuals taking care for friends, relatives or neighbors. These can be registered as a Patient's Contact. If performing some action or being referenced by another resource, use the [RelatedPerson](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\relatedperson.html) resource.

The primary distinction between a Practitioner and a RelatedPerson is based on whether:

* The person/animal operates on behalf of the care delivery organization over multiple patients (Practitioner) or,
* Where the person/animal is not associated with the organization, and instead is allocated tasks specifically for the RelatedPerson's Patient (RelatedPerson).

A standard extension [animalSpecies](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\extension-practitioner-animalspecies.html) can be used to indicate the species of a service animal.

## Background and Context

Practitioner performs different roles within the same or even different organizations. Depending on jurisdiction and custom, it may be necessary to maintain a specific Practitioner Resource for each such role or have a single Practitioner with multiple roles. The role can be limited to a specific period, after which authorization for this role ends. Note that the represented organization need not necessarily be the (direct) employer of a Practitioner.

# source\practitioner\practitioner-notes.xml

## Notes:

* Practitioner.period is different from Qualification.period: the first concerns the period during which the Practitioner is allowed to perform in the given roles for the organization. The second is about the period of validity for qualifications for which licenses have been obtained by training or otherwise.

# source\relatedperson\relatedperson-examples-header.xml

# source\relatedperson\relatedperson-introduction.xml

## Scope and Usage

RelatedPersons typically have a personal or non-healthcare-specific professional relationship to the patient. A RelatedPerson resource is primarily used for attribution of information, since RelatedPersons are often a source of information about the patient. For keeping information about people for contact purposes for a patient, use a Patient's Contact element. Some individuals may serve as both a Patient's Contact and a Related Person.

Example RelatedPersons are:

* A patient's wife or husband
* A patient's relatives or friends
* A neighbor bringing a patient to the hospital
* The owner or trainer of a horse
* A patient's attorney or guardian
* A Guide Dog

## Boundaries and Relationships

The primary distinction between a Practitioner and a RelatedPerson is based on whether:

* The person/animal operates on behalf of the care delivery organization over multiple patients (Practitioner) or,
* Where the person/animal is not associated with the organization, and instead is allocated tasks specifically for the RelatedPerson's Patient (RelatedPerson).

A standard extension [animalSpecies](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\extension-practitioner-animalspecies.html) can be used to indicate the species of a service animal.

# source\relatedperson\relatedperson-notes.xml

# source\schedule\schedule-examples-header.xml

# source\schedule\schedule-introduction.xml

## Scope and Usage

Schedule resources provide a container for time-slots that can be booked using an appointment, It provides the window of time (period) that slots are defined for and what type of appointments can be booked.  
The schedule does not provide any information about actual appointments. This separation also greatly assists where access to the appointments would not be permitted for security or privacy reasons, and still being able to determine if an appointment might be available.

Note: A schedule is not used for the delivery of medication, that is the [Timing](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\datatypes.html#Timing) data type.

### Context

A schedule controls the dates and times available for the performance of a service and/or the use of a resource. One schedule applies to one service or resource, since each service or resource can be reserved independently of the others.  
(If two or more services, people, locations, or things cannot be reserved independently of one another, they are considered to be one activity or resource.)

A schedule consists of slots of time during which the controlled service or resource is potentially available for provision or use. Slots are categorized as open, booked, or blocked. An open slot on a schedule indicates that the service or resource is available for provision or use during that period of time. A booked slot indicates that the service or resource is not available during the time period, because an appointment has been scheduled. A blocked slot indicates that a service or resource is unavailable for reasons other than a scheduled appointment.

The real-world, non-automated analog of the schedule described above is a standard appointment book. These books are generally organized with rows of time slots, during which a service or resource is available.

A slot is one unit on a schedule. A slot represents the smallest unit of time or quantity that a service or resource may be booked. Depending on the nature of the service or resource, there may be more than one defined slot at a given instant of time. For example, if a service is an open group therapy session with twelve available seats, then there are twelve slots for the given block of time.

### Actor - What the schedule applies to

The schedule belongs to a single owner, the actor. This is normally a HealthcareService, Practitioner, Location or Device. When booking an appointment, multiple schedules may need to be checked depending on the configuration of the system.

If an appointment has 2 practitioners, a specific medical device and a room then there could be a schedule for each of these resources that may need to be consulted to ensure that no collisions occur.  
If the schedule needed to be consulted, then there would be one created covering the planning horizon for the time of the appointment.

### Checking availability - Searching

When checking availability for an appointment, the creator of the appointment should check that the see what schedules are applicable, then check for available slots within these schedules.

The searching could be done via the properties of the referenced actors, such as the ServiceCategory on the HealthcareService, or the Address on a Location.

The type property can be used to filter the types of appointments that can be booked within the appointment. These can be filtered down further by specifying types on the slots too.  
The terminology bound to this property will be the same as that used on appointment and slot too.

If all slots are busy, the caller could find some slots that they believe are close enough, and request for the appointment in these slot(s)  
(the appointment may be given a higher precedence and allocated in an overbooked status if business rules permit)

# source\schedule\schedule-notes.xml

## Notes:

### Interaction with other Standards

The strong desire is that implementers of this resource should consider providing this resource in the iCalendar format as an alternative representation. Many 3rd party applications and component providers have parsers and user interface controls to display this information. This may lower the entry point to integrate outside the health-care specific applications, and into the consumer space. This would permit the easier creation of a mobile application that creates appointments in the devices native calendar.  
The iCalendar specification can be found at <http://www.ietf.org/rfc/rfc2445.txt>.

### Slots - not a contained resource

Due to the dynamic nature of slots they are not included as a part of this resource.

It is anticipated that this resource is likely to be updated intermittently when the scope of slots is changed, i.e. to change the period of slots in the planning horizon. This could be performed each night to move the start and end date forward to keep the planning horizon as exactly 4 weeks.

The slot resource however is anticipated to be updated very regularly as the appointments that reference them are created/updated/cancelled.

# source\slot\slot-examples-header.xml

# source\slot\slot-introduction.xml

## Scope and Usage

Slot resources are used to provide time-slots that can be booked using an appointment. They do not provide any information about appointments that are available, just the time, and optionally what the time can be used for. These are effectively spaces of free/busy time.  
Slots can also be marked as busy without having appointments associated.

A slot can have more than one appointment allocated to it. A scheduling system may permit multiple allocations up to a specific number of places. An example of this type of usage could be where the slot is being used for a group service that permits 5 participants at the same time.

A slot can be marked as over-booked indicating that there are too many appointments allocated to it.

In some situations a service may have a specific set of slots reserved for specific uses, such as "walk-ins" or a specific Organization has a "standing booking" for Thursday mornings. These should be represented using the type field with a specified and agreed value.  
Security Permissions or specific business rules on the system could enforce that only eligible appointments are allocated to them.

If a service had a weekly schedule created that permitted eight 1 hour appointments each day of a working week (Monday - Friday), this would be constructed by a single Schedule resource with the dates for the start and end of the week set, and then 40 (5x8) Slot resources associated with it.  
As appointments fill up the schedule, these slots would individually be marked as busy as the appointments are filled into the slots.  
The slots in a schedule do not need to be the same size, and can be different for different days of the week.  
Slot instances do not have any recurrence information included. If recurring information is desired, this will be managed outside these resources, or included as extensions.

# source\slot\slot-notes.xml

## Notes:

* Interaction with other Standards

The strong desire is that implementers of this resource should consider providing this resource in the iCalendar format as an alternative representation. Many 3rd party applications and component providers have parsers and user interface controls to display this information. This may lower the entry point to integrate outside the health-care specific applications, and into the consumer space. This would permit the easier creation of a mobile application that creates appointments in the devices native calendar.  
The iCalendar specification can be found at <http://www.ietf.org/rfc/rfc2445.txt>.

# source\allergyintolerance\allergyintolerance-examples-header.xml

# source\allergyintolerance\allergyintolerance-introduction.xml

## Scope and Usage

A record of a clinical assessment of an allergy or intolerance; a propensity, or a potential risk to an individual, to have an adverse reaction on future exposure to the specified substance, or class of substance.

Where a propensity is identified, to record information or evidence about a reaction event that is characterized by any harmful or undesirable, physiological response that is specific to the individual, and triggered by exposure of an individual to the identified substance or class of substance.

Substances include, but are not limited to: a therapeutic substance administered correctly at an appropriate dosage for the individual; food; material derived from plants or animals; or venom from insect stings.

**Note for Reviewers**

Presently open issues for this resource:

* This resource represents a condition of susceptibility to a substance, with a list of supporting events and/or symptoms, and has no direct relationship to an event reporting framework; this will be re-assessed when adverse event reporting resource(s) and/or profiles are added to FHIR (not expected to happen prior to DSTU 2)
* Other HL7 models and the openEHR archetype have "exposure date" but this is not found in any surveyed systems, so this is left as an extension (more appropriate for adverse event reporting)

## Boundaries and Relationships

This resource is used to provide a single place within the health record to document a range of clinical statements about adverse reactions, including:

* record a clinical assessment of the individual's propensity to a potential future reaction upon re-exposure
* record cumulative information about the reaction to each exposure, including 'no reaction' if appropriate

Use to record information about the positive presence of the risk of an adverse reaction:

* to support direct clinical care of an individual
* as part of a managed adverse reaction or allergy/intolerance list
* to support exchange of information about the propensity and events related to adverse reactions
* to inform adverse reaction reporting
* to assist computerized knowledge-based activities such as clinical decision support and alerts

Use to record information about adverse reactions to a broad range of substances, including: biological & blood products; incipient and excipients in medicinal preparations; foods; metal salts; and organic chemical compounds.

Adverse reactions may be:

* an allergy (immune mediated reaction - most commonly type I hypersensitivity)
* an intolerance (non-immune mediated reaction) - including pseudoallergic reactions, side effects, drug toxicities (e.g., to gentamicin), drug-drug interactions, food-drug interactions, and drug-disease interactions

In clinical practice distinguishing between allergic (immune-mediated) and intolerance (non-immune mediated) reactions is difficult and may not be practical. Often the term "allergy" is used in a rather generic sense which may overlap with the use of "intolerance" - in practice the boundaries between these two concepts may not be well-defined or understood. The term "intolerance" should be generally applied to reactions and to the propensity for future reactions where either the sensitivity is felt to not be on an immunologic basis or when the mechanism is unknown. Identification of the type of reaction is not a proxy for seriousness or risk of harm to the patient, which is better expressed by the manifestation in clinical practice.

The sensitivity in the case of either an allergy or intolerance is unique to the individual, and is distinguished from those reactions that are a property of the circumstance, such as toxicity of a food or drug, overdose, drug-drug, drug-food, or drug-disease interaction (which are reactions that would be expected to occur for any individual given the same circumstances).

The risk of an adverse reaction event or manifestation should not be recorded without identifying a proposed causative substance or class of substance. If there is uncertainty that a specific substance is the cause, this uncertainty can be recorded using the 'status' data element. If there are multiple possible substances that may have caused a reaction/manifestation, each substance should be recorded using a separate instance of this resource with the 'status' set to an initial state of 'unconfirmed' so that adverse reaction checking can be supported in clinical systems. If a substance, agent or class is later proven not to be the cause for a given reaction then the 'status' can be modified to 'refuted'.

This resource has been designed to allow recording of information about a specific substance (amoxicillin, oysters, or bee sting venom) or, alternatively, a class of substance (e.g. penicillins)). If a class of substance is recorded then identification of the exact substance can be recorded on a per exposure basis.

The scope of this FHIR resource has deliberately focused on identifying a pragmatic data set that are used in most clinical systems or will be suitable for most common clinical scenarios; [extensions can be used](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\extensibility.html) to add additional detail if required. Examples of clinical situations where the extension may be required include: a detailed allergist/immunologist assessment, for reporting to regulatory bodies or use in a clinical trial.

The act of recording any adverse reaction in a health record involves the clinical assessment that a potential hazard exists for an individual if they are exposed to the same substance/agent/class in the future â€“ that is, a relative contraindication - and, in the absence of additional information indicating a higher level of potential risk, the default 'criticality' value should be set to 'Low Risk'. If a clinician considers that it is not safe for the individual to be deliberately re-exposed to the substance/agent again, for example, following a manifestation of a life-threatening anaphylaxis, then the 'criticality' data element should be amended to 'High Risk'.

A formal adverse event report to regulatory bodies is a document that will contain a broad range of information in addition to the specific details about the adverse reaction. The report could utilise parts of this resource plus include additional data as required per jurisdiction.

An adverse reaction or allergy/intolerance list is a record of all identified propensities for an adverse reaction for the individual upon future exposure to the substance or class, plus provides potential access to the evidence provided by details about each reaction event, such as manifestation.

Valuable first-level information that could be presented to the clinician when they need to assess propensity for future reactions are:

* statements about previous clinical manifestations following exposure
* source of the information/reporter
* the 'criticality' flag

Second-level information can be drawn from each exposure event and links to additional detailed information such as history, examination and diagnoses stored elsewhere in the record, if it is available.

**AllergyIntolerance and RiskAssessment**

AllergyIntolerance describes a specific type of risk - propensity to reaction to a substance while [RiskAssessment](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\riskassessment.html) describes general risks to a subject, not generally based on a reaction.

**AllergyIntolerance and Immunization.reaction**

[Immunization.reaction](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\immunization-definitions.html#Immunization.reaction) may be an indication of an allergy or intolerance. If this is deemed to be the case, a separate [AllergyIntolerance](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\allergyintolerance.html) record should be created to indicate it, as most systems will not query against past Immunization.reaction.

**Misuse**

* The allergy/intolerance list exists as a patient safety tool to inform decision support around ordering of medications and nutrition and to guide clinical treatment. Other reactions triggered by physical stimuli -- light, heat, cold, pressure, vibration, which may mimic allergic or intolerance reactions, should be recorded as [Condition](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\condition.html) on the problem list, not using AllergyIntolerance.
* Not to be used to record adverse events, including failures of clinical process, interventions or products. For example: abnormal use or mistakes/errors made in maladministration of an agent or substance; incorrect dosage; mislabeling; harm or injury caused by an intervention or procedure; overdose/poisoning etc.
* Not to be used as a proxy for an adverse event report. See above for how it may be used as one component of an adverse event report
* Not to be used for recording alerts. Alerts are handled using [Flag](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\flag.html) or - where event-specific, [DetectedIssue](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\detectedissue.html)
* Not to be used for recording failed therapy

# source\allergyintolerance\allergyintolerance-notes.xml

### Negated Allergies and Intolerances

It is important to differentiate between affirmatively stating that a patient has no known allergies versus either not including allergies in the record (for example an episodic document where the allergies are not considered relevant to the document); or asserting that allergies were not reviewed and are unknown.

Allergies with the status "entered-in-error" are considered to be inactive allergies.

Allergies with the status "refuted" must be displayed to indicate that a reaction to a substance has been ruled out with the high level of clinical certainty (e.g. additional testing, rechallenging).

Prior to adding a new allergy/intolerance, a list of existing negated and refuted reactions should be reviewed and reconciled.

**Allergies Not Reviewed, Not Asked**

When a sending system does not have any information about allergies being reviewed or the statement is about Allergies not being asked yet, then the [List](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\list.html) resource should be used to indicate the List.emptyReason.code="notasked".

**Allergies Reviewed, None Identified**

Systems should use the List.emptyReason when a statement is about the full scope of the list (i.e. the patient has no known allergies or intolerances of any type), while it will use negated AllergyIntolerance instances when the record is more fine-grained (e.g. no drug allergies, no food allergies, no nut allergies, etc.)

However, it's possible to include negation statements that apply at the level of the whole list and it's also possible to have separate lists for things like medication allergies vs. food allergies, where that's appropriate to the architecture. Also note that care should be used when adding new AllergyIntolerances to a list to ensure that any negation statements that are voided by the addition of a new record are removed from the list. E.g. If the list contains a "no known food allergies" record and you add an "intolerance to grape flavor" record, then be sure you remove the "no known food allergies" record.

No Known Allergies, using the [List](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\list.html) resource

<List xmlns="http://hl7.org/fhir" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://hl7.org/fhir ..\..\schema\list.xsd">

<id value="example-empty-allergy"/>

<text>

<status value="generated"/>

<div xmlns="http://www.w3.org/1999/xhtml">

<p> The patient is not aware of any allergies.</p>

</div>

</text>

<code>

<coding>

<system value="http://loinc.org"/>

<code value="52472-8"/>

<display value="Allergies and Adverse Drug Reactions"/>

</coding>

<text value="Current Allergy List"/>

</code>

<source>

<reference value="Patient/example"/>

</source>

<status value="current"/>

<date value="2012-11-26T07:30:23+11:00"/>

<mode value="snapshot"/>

<emptyReason>

<coding>

<system value="http://hl7.org/fhir/special-values"/>

<code value="nil-known"/>

<display value="Nil Known"/>

</coding>

<text value="The patient is not aware of any allergies."/>

</emptyReason>

</List>

No Known Food Allergies and Medication Allergy List

<?xml version="1.0" encoding="UTF-8"?>

<List xmlns="http://hl7.org/fhir" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://hl7.org/fhir ..\..\schema\list.xsd">

<id value="current-allergies"/>

<text>

<status value="generated"/>

<div xmlns="http://www.w3.org/1999/xhtml">

<p>Patient Peter Chalmers, DOB = Dec 25, 1974, MRN = 12345 (Acme Healthcare) has the following allergies</p>

<ul>

<li>No known food allergies</li>

<li>Allergenic extract, penicillin (high)</li>

</ul>

</div>

</text>

<code>

<coding>

<system value="http://loinc.org"/>

<code value="52472-8"/>

<display value="Allergies and Adverse Drug Reactions"/>

</coding>

<text value="Current Allergy List"/>

</code>

<source>

<reference value="Patient/example"/>

</source>

<status value="current"/>

<date value="2015-07-14T23:10:23+11:00"/>

<mode value="snapshot"/>

<entry>

<item>

<reference value="AllergyIntolerance/nofoodallergies"/>

</item>

</entry>

<entry>

<item>

<reference value="AllergyIntolerance/penicillin"/>

</item>

</entry>

</List>

If new allergy is discovered, the negated allergy record must be updated with the "refuted" status - to ensure that systems referring to this record are aware that this is no longer true.

**DSTU Note:** There are two ways of reporting "No Known Allergies" in the current specification: using the CodeableConcept, as described above, or using the [List](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\list.html) resource with emptyReason. During the trial use period for this DSTU, it is not recommended to use the [List](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\list.html) resource for "No Known Allergies" reporting purposes.

Feedback is sought [here](http://wiki.hl7.org/index.php?title=FHIR_Specification_Feedback_(DSTU_2)).

### Use of AllergyIntolerance.criticality

Systems that only support one notion will have to determine whether what they're capturing is criticality or severity and map to the appropriate place. Criticality refers to the likelihood the allergy/intolerance could result in significant harm. Severity refers to the degree of manifestation of the reaction symptom. Moderate breathing difficulty would have high criticality while a severe rash would have low criticality. Severity is specific to a particular reaction occurrence.

For systems that only track generic reaction characteristics rather than a specific reaction will provide guidance to use the "reaction" structure and simply provide no date.

### References

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# source\careplan\careplan-examples-header.xml

# source\careplan\careplan-introduction.xml

## Scope and Usage

Care Plans are used in many of areas of healthcare with a variety of scopes. They can be as simple as a general practitioner keeping track of when their patient is next due for a tetanus immunization through to a detailed plan for an oncology patient covering diet, chemotherapy, radiation, lab work and counseling with detailed timing relationships, pre-conditions and goals. They may be used in veterinary care or clinical research to describe the care of a herd or other collection of animals. In public health, they may describe education or immunization campaigns.

This resource takes an intermediate approach to complexity. It captures basic details about who is involved and what actions are intended without dealing in discrete data about dependencies and timing relationships. These can be supported where necessary using the extension mechanism.

The scope of care plans may vary widely. Examples include:

* Multi-disciplinary cross-organizational care plans. E.g. An oncology plan including the oncologist, home nursing staff, pharmacy and others
* Plans to manage specific disease/condition(s) (e.g. nutritional plan for a patient post bowel resection, neurological plan post head injury, pre-natal plan, post-partum plan, grief management plan, etc.)
* Decision support-generated plans following specific practice guidelines (e.g. stroke care plan, diabetes plan, falls prevention, etc.)
* Definition and management of a care team, including roles associated with a particular condition or set of conditions.
* Self-maintained patient or care-giver authored plans identifying their goals and an integrated understanding of actions to be taken

Note that this resource represents a specific plan instance for a particular patient or group. It is not intended to be used to define generic plans or protocols that are independent of a specific individual or group. I.e. It represents a specific intent, not a general definition. Protocols and order sets will be supported through future resources.

This resource can be used to represent both proposed plans (for example, recommendations from a decision support engine or returned as part of a consult report) as well as active plans. The nature of the plan is communicated by the status. Some systems may need to filter CarePlans to ensure that only appropriate plans are exposed via a given user interface.

## Boundaries and Relationships

For simplicity sake, CarePlan allows the in-line definition of activities as part of a plan using the activity.detail element. However, activities can also be defined using references to the various "request" resources. These references could be to resources with a status of "planned" or to an active order. It is possible for planned activities to exist (e.g. appointments) without needing a CarePlan at all. CarePlans are used when there's a need to group activities, goals and/or participants together to provide some degree of context.

CarePlans can be tied to specific [Conditions](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\condition.html) however they can also be condition-independent and instead focused on a particular type of care (e.g. psychological, nutritional) or the care delivered by a particular practitioner or group of practitioners.

An [ImmunizationRecommendation](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\immunizationrecommendation.html) can be interpreted as a narrow type of Care Plan dealing only with immunization events. Where such information could appear in either resource, the immunization-specific resource is preferred.

# source\careplan\careplan-notes.xml

## Open Issues

**DSTU Note:** During the Trial use period, feedback is welcome on two issues:

* This resource combines the concepts of "Care Plan" and "Care Team" into a single resource. Is this appropriate?
* At present, the patient element is optional to allow experimentation with care plan templates, though the resource was not designed for this use

Feedback [here](http://wiki.hl7.org/index.php?title=FHIR_Specification_Feedback_(DSTU_2)).

# source\communication\communication-examples-header.xml

**An introduction to this page as well as proper examples are to be submitted shortly.**

# source\communication\communication-introduction.xml

## Scope and Usage

This resource is a record of a communication. A communication is a conveyance of information from one entity, a sender, to another entity, a receiver. The sender and receivers may be patients, practitioners, related persons, organizations, or devices. Communication use cases include:

* A reminder or alert delivered to a responsible provider
* A recorded notification from the nurse that a patient's temperature exceeds a value
* A notification to a public health agency of a patient presenting with a communicable disease reportable to the public health agency
* Patient educational material sent by a provider to a patient

Non-patient specific communication use cases may include:

* A nurse call from a hall bathroom
* Advisory for battery service from a pump

## Boundaries and Relationships

This resource is a record of a communication that has occurred. It does not represent the actual flow of communication. While [AuditEvent](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\auditevent.html) can track electronic disclosures of information, it cannot track conversations, phone calls, letters and other interactions that are not system-to-system. And even for system-to-system communications, the specific end recipients may not be known. As well, [AuditEvents](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\auditevent.html) are not considered to be "part" of the patient record, while **Communication** instances are. The **Communication** resource is not used as a general audit mechanism to track every disclosure of every record. Rather, it is used when a clinician or other user wants to ensure a record of a particular communication is itself maintained as part of the reviewable health record.

[Flag](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\flag.html) resources represent a continuous ongoing "communication" alerting anyone dealing with the patient of certain precautions to take or issues to be aware of. The flags are continuously present as an ongoing reminder. This is distinct from **Communication** where there is a specific intended sender and receiver and the information is delivered only once.

**Communication and Encounter**

The Communication is about the transfer of information (which may or may not occur as part of an encounter), while Encounter is about the coming together (in person or virtually) of a Patient with a Practitioner. Communication does not deal with the duration of a call, it represents the fact that information was transferred at a particular point in time.

The phone calls involving the Patient should be handled using [Encounter](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\encounter.html). Phone calls not involving the patient (e.g. between practitioners or practitioner to relative) that are tracked for billing or other purposes can use Communication to represent the information transferred, but are not ideal to represent the call itself. A better mechanism for handling such calls will be explored in a future release.

# source\communication\communication-notes.xml

**Notes to reviewers:**

*At this time, the code bindings are placeholders to be fleshed out upon further review by the community.*

### Communication.sender and Communication.recepient

Communication.sender and Communication.recipient allow Patient|Practitioner|RelatedPerson - but it is not unusual to have a communication target - even a defined one - where it is unknown what kind of role the person is playing.

If the communication is to or from an individual, whose role is not known (practitioner, patient or related person), - for example, only email address is captured in the system; then RelatedPerson should be used by default.

# source\communicationrequest\communicationrequest-examples-header.xml

**An introduction to this page as well as proper examples are to be submitted shortly.**

# source\communicationrequest\communicationrequest-introduction.xml

## Scope and Usage

This resource is a record of a request for a communication to be performed. A communication is a conveyance of information from one entity, a sender, to another entity, a receiver. The sender and receivers may be patients, practitioners, related persons, organizations, and devices. Uses of communication request include:

* A computer-based decision-support system requesting a reminder or alert be delivered to a responsible provider
* A physician requesting notification from the nurse if a patient's temperature exceeds a value
* A monitoring system or a provider requesting a staff member or department to notify a public health agency of a patient presenting with a communicable disease reportable to the public health agency
* A computer-based decision-support system proposes to send educational material to a patient

## Boundaries and Relationships

This resource is a record of a request. It does not represent the actual flow of communication. The use of **CommunicationRequest** excludes requests for referrals which are covered by the [ReferralRequest](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\referralrequest.html) resource. It also excludes requests for therapy or counseling which would be handled by the [ProcedureRequest](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\procedurerequest.html) resource. The performance of a **CommunicationRequest** may result in a [Communication](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\communication.html) resource.

# source\communicationrequest\communicationrequest-notes.xml

**Notes to reviewers:**

*At this time, the code bindings are placeholders to be fleshed out upon further review by the community.*

### CommunicationRequest.sender and CommunicationRequest.recepient

CommunicationRequest.sender and CommunicationRequest.recipient allow Patient|Practitioner|RelatedPerson - but it is not unusual to have a communication target - even a defined one - where it is unknown what kind of role the person is playing.

If the communication request is to or from an individual, whose role is not known (practitioner, patient or related person), - for example, only email address is captured in the system; then RelatedPerson should be used by default.

# source\condition\condition-examples-header.xml

# source\condition\condition-introduction.xml

## Scope and Usage

Used to record detailed information pertinent to a clinician's assessment and assertion of a particular aspect of a person's state of health. Examples of condition include problems, diagnoses, concerns, issues. There are many uses of condition which include:

* recording a problem, diagnosis, health concern or health issue during an encounter
* the use of such information to populate a problem list of a summary statement such as a discharge summary

This resource is used to record detailed information about a clinician's assessment and assertion of a particular aspect of a patient's state of health. It is intended for use to record information about a disease/illness identified from application of clinical reasoning over the pathologic and pathophysiologic findings (diagnosis), or identification of health issues/situations that require ongoing monitoring and/or management (health issue/concern), or identification of health issues/situations considered harmful, potentially harmful and required to be investigated and managed (problems).

The condition resource may also be used to record certain health state of a patient which does not normally present negative outcome (until complications are predicted or detected), e.g. pregnancy. Examples of complications of pregnancy include: hyperemesis gravidarum, preeclampsia, eclampsia, which are captured as problems/diagnoses.

## Boundaries and Relationships

The condition resource may be referenced by other resources as "reasons" for an action (e.g. [MedicationOrder](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\medicationorder.html), [Procedure](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\procedure.html), [DiagnosticOrder](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\diagnosticorder.html), etc.)

This resource is not to be used to record information about subjective and objective information that might lead to the recording of a Condition. Such signs and symptoms that are typically captured using the [Observation](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\observation.html) resource; although in some cases a persistent symptom, e.g. fever, headache may be captured as a condition before a definitive diagnosis can be discerned by a clinician.

The condition resource also specifically excludes [AllergyIntoelrance](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\allergyintolerance.html) as those are handled with their own resource.

# source\condition\condition-notes.xml

### Use of Condition.code

Many of the code systems used for coding conditions will provide codes that define not only the condition itself, but may also specify a particular stage, location, or causality as part of the code. This is particularly true if SNOMED-CT is used for the condition, and especially if expressions are allowed.

The Condition.code may also include such concepts asÂ "history of X" andÂ "good health", where it is useful or appropriate to make such assertions.. It can also be used to capture "risk of" and "fear of" in addition to physical conditions.

When the Condition.code specifies additional properties of the condition, the other properties are not given a value - instead, the value must be understood from the Condition.code.

### Use of Condition.evidence

The Condition.evidence provides the basis for whatever is present in Condition.code.

### Use of Condition.abatementRange

A range is used to communicate age period of subject at time of abatement.

### Use of Condition.asserter

If the data enterer is different from the asserter and needs to be known, this could be captured using a Provenance instance pointing to the Condition. For example, it is possible that a nurse records the condition on behalf of a physician. The physician is taking responsibility, despite the nurse entering it into the medical record.

### Use of Condition.clinicalStatus

The Condition.stage and Condition.clinicalStatus may have interdependencies. For example, some "stages" of cancer, etc. will be different for a remission than for the initial occurrence.

# source\familymemberhistory\familymemberhistory-examples-header.xml

Examples of the Family History, using the [List](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\list.html) resource:

* [Real-world patient example](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\list-example-familyhistory-f201-roel.html)
* [Simple genetic family member history](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\list-example-familyhistory-genetics-profile.html)
* [Example for risk assessment](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\list-example-familyhistory-genetics-profile-annie.html)

# source\familymemberhistory\familymemberhistory-introduction.xml

## Scope and Usage

This resource records significant health events and conditions for a particular individual related to the subject. This information can be known to different levels of accuracy. Sometimes the exact condition ('asthma') is known, and sometimes it is less precise ('some sort of cancer'). Equally, sometimes the person can be identified ('my aunt Agatha') and sometimes all that is known is that the person was an uncle.

This resource represents a simple structure used to capture an 'elementary' family history for a particular family member. However, it can also be the basis for capturing a more rigorous history useful for genetic and other analysis - refer to the [Genetic Pedigree](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\list-example-familyhistory-genetics-profile.html) profile for an example.

The entire family history for an individual can be represented by combining references to **FamilyMemberHistory** instances into a [List](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\list.html) resource instance.

# source\familymemberhistory\familymemberhistory-notes.xml

### Processing information about the Femily Member History

The Family Member History [List](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\list.html) may contain other than FamilyMemberHistory resources. For example, a full Family History could be a [List](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\list.html) that might include a mixture of FamilyMemberHistory records as well as [Observation](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\observation.html) records of things like "maternal family history of breast cancer".

# source\flag\flag-examples-header.xml

# source\flag\flag-introduction.xml

## Scope and Usage

A flag is a warning or notification of some sort presented to the user - who may be a clinician or some other person involve in patient care. It usually represents something of sufficient significance to be warrant a special display of some sort - rather than just a note in the resource. A flag has a subject representing the resource that will trigger its display. This subject can be of different types, as described in the examples below:

* A note that a patient has an overdue account, which the provider may wish to discuss with them - in case of hardship for example (subject = Patient)
* An outbreak of Ebola in a particular region (subject=Location) so that all patients from that region have a higher risk of having that condition
* A particular provider is unavailable for referrals over a given period (subject = Practitioner)
* A patient who is enrolled in a clinical trial (subject=Group)

A flag is typically presented as a label in a prominent location in the record to notify the clinician of the potential issues, though it may also appear in other contexts. E.g. notes applicable to a radiology technician, or to a clinician performing a home visit. For patients, the information in the flag will often be derived from the record, and therefore, for a thorough and careful clinician, who has the time to review the notes will be redundant. However, given the volume of information frequently found in patients' records and the potentially serious consequences of losing sight of some facts, this redundancy is deemed appropriate. As well, some flags may reflect information not captured by any other resource in the record. (E.g. "Patient has large dog at home")

In line with its purpose, a flag is concise, highlighting a small set of high-priority issues among the much larger set of data in the chart. Readers who want more detail should consult the chart or other source of information. Caution should be exercised in creating Flag instances. If entries are created for information that could be gleaned in a sufficiently timely fashion by reviewing the patient record, the flag list will itself become overwhelming and will cease to serve its intended purpose.

Flags are expected to persist in a record for some period of time and are, at most, targeted to particular types of practitioners or to practitioners in particular system.

Examples of Patient related issues that might appear in flags:

* Risks to the patient (functional risk of falls, spousal restraining order, latex allergy)
* Patient's needs for special accommodations (hard of hearing, need for easy-open caps)
* Risks to providers (dog in house, patient may bite, infection control precautions)
* Administrative concerns (incomplete information, pre-payment required due to credit risk)

Examples of issues that should not appear **only** in flags:

* Potential allergy or drug interaction to planned therapy (use [DetectedIssue](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\detectedissue.html))
* Known adverse reaction to a substance (use [AllergyIntolerance](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\allergyintolerance.html))

Note that we include "latex allergy" in the "in scope" list, and "allergy" in the "not in scope" list. The Flag resource is not designed to replace the normal order checking process, and one should not expect to see all allergies in Flags. However, if there is an activity that might occur prior to careful evaluation of the record (e.g., donning of latex gloves) and that activity might pose a risk to the patient, that is the sort of eventuality the Flag is intended to support.

Specific guidelines about what type of information is appropriate to expose using Flag, as well as what categories of individuals should see particular flags, will vary by interoperability community.

## Boundaries and Relationships

Flags may highlight a highly condensed view of information found in the [AllergyIntolerance](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\allergyintolerance.html), [Condition](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\condition.html), [Observation](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\observation.html), [Procedure](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\procedure.html) and possibly other resources. A [common extension](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\extension-flag-detail.html) allows the linkage of a Flag to the supporting detail resource. The purpose of these other resources is to provide detailed clinical information. The purpose of a Flag is to alert practitioners to information that is important to influence their interaction with a Patient prior to detailed review of the record.

Flags are not used to convey information to a specific individual or organization (e.g. an abnormal lab result reported to the ordering clinician, reporting of an adverse reaction to a regulatory authority). These are handled using the [CommunicationRequest](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\communicationrequest.html) and the [Communication](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\communication.html) resources.

Flags are not raised as a result of a reported or proposed action (e.g. drug-drug interactions, duplicate therapy warnings). These would be handled using [DetectedIssue](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\detectedissue.html).

# source\flag\flag-notes.xml

The Flag resource is sometimes known as "patient notes" and MAY be used to warn of issues such as:

* Issues that impact on the patient's ability to receive/respond to care the care provision process itself (e.g. poor language comprehension, low compliance expected)
* Issues that impact on the ability to provide care (e.g. patient has a big dog at home)
* Financial matters (e.g. patient is a bad debtor)

# source\goal\goal-examples-header.xml

# source\goal\goal-introduction.xml

## Scope and Usage

A Goal in health care services delivery is generally an expressed desired health state to be achieved by a subject of care (or family/group) over a period or at a specific point of time. This desired target health state may be achieved as a result of health care intervention(s) or resulting from natural recovery over time. For example:

* A goal of a plan for a condition such as a diabetes might specify desired outcome(s) (e.g. HgbA1c level =<5.6% in 3 months) as a result of interventions such as medication therapy, nutritional management and/or increase physical activity.
* A goal of a procedure might be to meet the intended objective of the procedure (e.g. wet-dry-dressing changes twice a day; goal: wound healed completely in 2 weeks) or to prevent an unintended complication (e.g. repositioning a patient every two hours: goal to maintain skin integrity)

Goals may address the prevention of illness, cure or mitigation of a condition, prolongation of life, or mitigation of pain and discomfort.

When dealing with groups, goals may also reflect health state, such as a reduction of addiction behaviors. However, they may also reflect population health objectives such as education, screening, etc.

Organizational goals are typically not health state specific but may instead identify measurement targets such as infection control, cost management, patient satisfaction, etc.

Note that this resource represents a specific goal instance for a particular patient, group, etc. It is not intended to be used to define types of "potential" goals as part of an order set or protocol. These requirements will be supported as part of future resources.

## Boundaries and Relationships

Goals are typically established in the context of a [CarePlan](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\careplan.html). However, goals may also be directly referenced by request-type resources (e.g. [MedicationOrder](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\medicationorder.html) or [ReferralRequest](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\referralrequest.html)) by using an extension.

Goals are often evaluated using [Observations](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\observation.html).

# source\goal\goal-notes.xml

# source\procedure\procedure-examples-header.xml

# source\procedure\procedure-introduction.xml

## Scope and Usage

This resource is used to record the details of procedures performed on a patient. A procedure is an activity that is performed with or on a patient as part of the provision of care. Examples include surgical procedures, diagnostic procedures, endoscopic procedures, biopsies, counseling, physiotherapy, exercise, etc. Procedures may be performed by a healthcare professional, a friend or relative or in some cases by the patient themselves.

This resource provides summary information about the occurrence of the procedure and is not intended to provide real-time snapshots of a procedure as it unfolds, though for long-running procedures such as psychotherapy, it could represent summary level information about overall progress. The creation of a resource to support detailed real-time procedure information awaits the identification of a specific implementation use-case to share such information.

## Boundaries and Relationships

The Procedure resource should not be used to capture an event if a more specific resource already exists - i.e. [immunizations](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\immunization.html), [drug administrations](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\medicationadministration.html) and [communications](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\communication.html). The boundary between determining whether an action is considered to be training or counseling (and thus a procedure) as opposed to a Communication is based on whether there's a specific intent to change the mind-set of the patient. Mere disclosure of information would be considered a Communication. A process that involves verification of the patient's comprehension or to change the patient's mental state would be a Procedure.

Note that many diagnostic processes are procedures that generate [Observations](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\observation.html) and [DiagnosticReports](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\diagnosticreport.html). In many cases, such an observation does not require an explicit representation of the procedure used to create the observation, but where there are details of interest about how the diagnostic procedure was performed, the procedure resource is used to describe the activity.

Some diagnostic procedures may not have a Procedure record. Â The Procedure record is only necessary when there is a need to capture information about the physical intervention that was performed to capture the diagnostic information (e.g. anesthetic, incision, scope size, etc.)

# source\procedure\procedure-notes.xml

### Use of Procedure properties

Many of the elements of Procedure have inherent relationships and may actually all be conveyed by the Procedure.code or in the text element of the Procedure.code property. I.e. You may be able to infer category, bodySite and even indication. Whether these other properties will be populated may vary by implementation.

Care should be taken to avoid nonsensical combinations/statements. E.g. "name=amputation, bodySite=heart"

### Use of Procedure.used

For devices, these are devices that are incidental to / or used to perform the procedure - scalpels, gauze, endoscopes, etc. Devices that are the focus of the procedure should appear in Procedure.device instead.

# source\procedurerequest\procedurerequest-examples-header.xml

**An introduction to this page as well as proper examples are to be submitted shortly.**

# source\procedurerequest\procedurerequest-introduction.xml

## Scope and Usage

A *Procedure Request* is a record of a request for a procedure to be performed. It can be used to represent a procedure that is planned, that is proposed, or that is ordered, as distinguished by the value of the ProcedureRequestStatus field.

A procedure is an activity that is performed with or on a patient as part of the provision of care. Examples include surgical procedures, diagnostic procedures, endoscopic procedures, biopsies, counseling, physiotherapy, exercise, etc. Procedures may be performed by a healthcare professional, a friend or relative or in some cases by the patient themselves.

The procedure request may represent an order that is entered by a practitioner in a CPOE system as well as a proposal made by a clinical decision support (CDS) system based on a patient's clinical record and context of care. Planned procedures referenced by a [CarePlan](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\careplan.html) may also be represented by this resource.

## Boundaries and Relationships

ProcedureRequest is closely related to other types of "request" resources, particularly [DiagnosticOrder](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\diagnosticorder.html) and [ReferralRequest](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\referralrequest.html). In fact, for some services, it may be appropriate to use any one of these resources to request that the procedure be performed. Which one is used may be driven by organization practice and by context. When it is unclear which to use, the following principles may be helpful:

* ProcedureRequest or DiagnosticOrder are typically used when the requesting clinician has and wishes to exercise the authority (and expertise) to decide exactly what action will be done.
* A ReferralRequest is used when the requesting practitioner is seeking another practitioner or organization to use their own expertise and/or authority to determine the specific action to take.
* Whether an activity is deemed to be a procedure or only a diagnostic order is typically driven by how invasive the diagnostic process is. More invasive processes are typically represented as procedures, though the dividing line may vary by organization.

Irrespective of the guidance above, systems should be prepared for some degree of overlap between these resources and be prepared to execute searches against multiple resources in cases where differentiation cannot be guaranteed. As well, in some workflows more than one type of resource or even all three might exist. E.g. Upon receiving a ReferralRequest a practitioner might initiate a DiagnosticOrder. The diagnostic service might then initiate a ProcedureRequest.

The notion of ProcedureRequest and [CommunicationRequest](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\communicationrequest.html) are also closely related. The boundary between determining whether an action is considered to be training or counseling (and thus a ProcedureRequest) as opposed to a CommunicationRequest is based on whether there's a specific intent to change the mind-set of the patient. A request to merely disclose information would be considered a CommunicationRequest. Invocation of a process that will involve verification of the patient's comprehension or an attempt to change the patient's mental state would be a ProcedureRequest.

# source\procedurerequest\procedurerequest-notes.xml

**Notes to reviewers:**

*At this time, the code bindings are placeholders to be fleshed out upon further review by the community.*

# source\questionnaire\questionnaire-examples-header.xml

# source\questionnaire\questionnaire-extensions-introduction.xml

### Scope and Usage

The core extensions provide HL7 provided extensions to the [Questionnaire](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\questionnaire.html) resource.

# source\questionnaire\questionnaire-extensions-notes.xml

# source\questionnaire\questionnaire-introduction.xml

## Scope and Usage

A **Questionnaire** is an organized collection of questions intended to solicit information from patients, providers or other individuals involved in the healthcare domain. They may be simple flat lists of questions or can be hierarchically organized in groups and sub-groups, each containing questions. The **Questionnaire** defines the questions to be asked, how they are ordered and grouped and what the constraints are on the allowed answers. The results of a **Questionnaire** can be communicated using the [QuestionnaireResponse](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\questionnaireresponse.html) resource.

Questionnaires cover the need to communicate data originating from forms used in medical history examinations, research questionnaires and sometimes full clinical specialty records. In many systems this data is collected using user-defined screens and forms. Questionnaires define specifics about data capture - exactly what questions were asked, in what order, what choices for answers were, etc. Each of these questions is part of the Questionnaire, and as such the Questionnaire is a separately identifiable Resource, whereas the individual questions are not.

Examples of Questionnaires include:

* Past medical history (PMH)
* Family diseases
* Social history
* Research questionnaires/Clinical research forms (CRFs)
* Quality and evaluation forms
* Patient intake form (e.g. clipboard)
* Insurance claim form

This resource is limited in scope to support the characteristics of simple questionnaires. However, common extensions have been defined to allow more sophisticated behavior. This includes:

* [Questionnaire core extensions](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\questionnaire-extensions.html) which defines the additional descriptive characteristics for questionnaires and their groups and questions
* [Element extensions](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\element-extensions.html) which can describe additional constraints on allowed answers for questionnaires such as string length and date and numeric ranges

Additional profiles such as the [Structured Data Capture Questionnaire profile](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\sdc\questionnaire-sdc.html) may provide additional capabilities for defining more sophisticated questionnaires and forms.

## Boundaries and Relationships

**Questionnaires** differ from [Lists](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\list.html) because [Lists](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\list.html) group existing resources, while **Questionnaires** group arbitrary questions. In theory, a **Questionnaire** could be expressed as a [List](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\list.html) or [Composition](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\composition.html) containing [DataElement](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\dataelement.html) resources. However, the former would disregard the "wholeness" associated with a questionnaire where questions must generally be maintained as a single structure. The latter would focus on rendering of the data elements rather than organizing the capture of information.

## Background and Context

Groups and questions that make up a Questionnaire can be explicitly coded to refer to externally defined numbering or identification of questions and sections on formally defined questionnaires. This allows extraction of the data on a form and post-processing of the data contained in a Questionnaire. Such coding is not required however and Questionnaires may be quite loosely defined. The section [Questionnaire versus Resources](#qversusr) below discusses the issues of collecting data in such loosely defined Questionnaires versus collecting data as well-defined separate Resources.

# source\questionnaire\questionnaire-notes.xml

## Notes:

* Questionnaires may be used to represent predefined forms or panels, referenced using Questionnaire.group.concept.
* A Questionnaire's contents are placed inside its single nested Group, which may contain Questions or subgroups with Questions.
* Groups and Questions may have linkIds allowing groups and question answers captured in a [QuestionnaireResponse](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\questionnaireresponse.html) to be associated with their corresponding group or question.
* Questionnaire allows for flexible naming and structuring of its contents to reflect the flexible and varying nature of forms and questionnaires. It explicitly does not try to standardize or streamline exchange of its contents outside its context of use, although exchanging partners may further constrain its structure and flexibility using profiles to define standardized, reusable forms.
* Because of the lack of explicit support for Questionnaires in HL7v3, HL7 CDA Documents frequently used named sections with Observations to model Questionnaires. Such use cases should now utilize the Questionnaire Resource instead.
* The order of questions within groups, groups within groups and groups within questions is relevant and must be retained for display and capture.

### Using Questionnaires versus using Resources

There is considerable overlap between the information covered by **Questionnaires** and other Resources (especially [FamilyMemberHistory](C:\\Users\\Lloyd\\Documents\\SVN\\FHIR\\build\\qa\\familymemberhistory.html), [MedicationStatement](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\medicationstatement.html), [Observation](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\observation.html), [Procedure](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\procedure.html), etc.): **Questionnaire's** flexible structure can easily be misused to capture any data, even data that should be captured as separate Resources. The choice between using **Questionnaires** or separate Resources may be dictated by the procedure of collection and recording. E.g. if the data is captured as a physician-agreed (electronic) form, it might be impossible or undesirable to distill separate resources from it and capturing the data in a **Questionnaire** would be most appropriate.

However, data captured only in **Questionnaires** can be difficult to query after-the-fact. Queries against other Resources will not return data captured only in **Questionnaires**, and querying against **Questionnaires** directly may not find all desired data, depending on how the questions may have been phrased or encoded over time or by different clinicians. Moreover, interoperability of such **Questionnaires** is limited as interpretation of its contents is only known to the circle of parties that were involved in its definition: encoding data from such **Questionnaires** using other, more specific, Resources increases the ability and consistency with which it can be understood and queried.

It is entirely possible for data to exist in both QuestionnaireResponse and in other resources. For example, data may be captured in [QuestionnaireResponse](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\questionnaireresponse.html) as part of an intake questionnaire. That data may then be propagated into the [Patient](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\patient.html) resource (demographics), [FamilyMemberHistory](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\familymemberhistory.html), [AllergyIntolerance](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\allergyintolerance.html), [MedicationStatement](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\medicationstatement.html) and [Observation](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\observation.html) resources to allow the data to be queried and analyzed. The original [QuestionnaireResponse](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\questionnaireresponse.html) instance can be retained for traceability purposes. For example, if a questionnaire question asks "what is your weight", that can then result in the creation of an [Observation](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\observation.html) with the appropriate Observation.code and the specified answer as the Observation.valueQuantity.

### Structure of the Questionnaire

A Questionnaire is built out of three components:

* The main component is Questionnaire, which holds information about the Questionnaire, like the identifier, publisher, date authored, etc. The Questionnaire contains one "root" Group, which contains all the content of the questionnaire. This "root" group contains elements that apply to the entire questionnaire - the title for the questionnaire, the concept that represents the meaning of the overall questionnaire (e.g. a code for "family history"), the text to display at the top of the questionnaire, etc. (In most cases, required would be 'true' and repeats would be false for the root group
* This Group can contain either nested Groups (to represent sections and subsections on a questionnaire form) or Questions. This way, any form containing sections or subsections can be represented, down to the actual questions.
* The Questions themselves may be simple questions with a prompt text and one expected answer, but they may also contain nested groups, each containing sets of nested questions. This way, one can model "panels" of questions which would only be relevant (and thus would only be displayed) depending on the answers of a parent question. E.g. a question "Did the patient receive treatment in the past six months?" would contain a nested group of questions asking for further details about the treatment. See an [example](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\questionnaire-example-bluebook.xml.html) from the [Australian New South Wales blue book](http://www.health.nsw.gov.au/Kids/Publications/my-personal-health-record.pdf)
* Specific controls on dynamic display of groups, questions, etc. based on the answers to other questions is outside the scope of the base resource and are expected to be introduced as extensions.

### Identifiers within Questionnaire

There are three different "identifying" elements within Questionnaire: identifier, id and linkId. Each serves very distinct purposes:

* **identifier** is used to reference the overall questionnaire in business terms. It is the number printed across the top of the form or listed beside the form when making a choice between alternate forms.
* The **id** attribute supported on each element is used for references within a resource, for example linking narrative to discrete elements
* The **linkId** element on questions and groups establishes a link between elements in a [QuestionnaireAnsers](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\questionnaireresponse.html) and their definition inside a Questionnaire. This is the *only* way to link between the groups and questions in a Questionnaire and QuestionnaireResponse

### Question Definitions

Questionnaires can be crafted using any questions the author can conceive phrased in whatever manner is appropriate or convenient. However, standardization of questions and the constraints enforced on the accompanying answers increases the ability to compare data gathered across questionnaires. There are two mechanisms defined in the specification for linking a Question (or Group) to a standardized definition:

* The concept element on both Group and Question allows an individual question, a group of questions or even the questionnaire as a whole to be associated with a pre-defined terminology of questions and question groups such as LOINC
* The [deReference](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\questionnaire-extensions.html#deReference) extension allows a question or group to be associated with the [DataElement](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\dataelement.html) (DE) resource that formally defines the data element.

Linking to formal definitions of a question allows data captured by distinct questionnaires to be compared. If systems have the necessary mappings to the formal definition, linkages to formal definitions may also be used to automatically pre-populate or extract data from a corresponding [QuestionnaireResponse](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\questionnaireresponse.html) resource.

NOTE: Even if standard question definitions are referenced using concept or the deReference extension, information such as the question text, data type and value set SHOULD still be declared for the question. Systems processing the questionnaire may not have access to or support the ability to look up the question definitions from external sources. If the information is not included in-line within the questionnaire, other systems may not be able to to render or use the Questionnaire.

If an external reference (concept or deReference extension) is included along with question information such as question text, data type or value set, it is expected that the content for the question and the referenced definition would be in alignment. However, FHIR does not dictate what degree of alignment is required. E.g. Does the question text need to match exactly? Is it legitimate for a question to constrain the allowed value set of possible answers? These rules will need to be established within implementation environments.

### Question types

The codes for the data type for each question is slightly different than the data types allowed in the [QuestionnaireResponse](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\questionnaireresponse.html) resource. Where the names are the same (ignoring case), the "answer" must use the specified type. Where the names are different, the mappings are as follows:

|  |  |
| --- | --- |
| **Questionnaire AnswerFormat code** | **QuestionnaireResponse data type** |
| text | string |
| url | uri |
| choice | Coding |
| open-choice | Coding |

### Permitted values for questions

Many questionnaires place constraints on the allowed list of values for a given question. FHIR supports this notion through the ...question.choices element. However, rather than listing the choices directly, the choices element points to a [ValueSet](C:\\Users\\Lloyd\\Documents\\SVN\\FHIR\\build\\qa\\valueset.html) resource. This approach adds complexity for questionnaires having a simple list of strings as choices for a question, but provides several benefits:

* Questionnaires that reference codes from externally defined code systems have a means of doing so
* Answer sets can be shared across questions (and there are many questionnaires where this capability is useful)
* The full capability of value sets can be brought into play, including the ability to use ConceptMap to link to translate from questionnaire-specific codes to other codes, the use of multiple display names (e.g. different languages), the ability to use coded ordinals, the ability to allow choices from larger value sets (e.g. "all SNOMED CT procedure codes")
* etc.

In many cases, the set of code choices will be specific to a given questionnaire and should be maintained as part of the questionnaire. In this case, the referenced ValueSet can be included as a [contained](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\references.html#contained) resource. All contained ValueSets are listed together and then are referenced by the individual questions as necessary.

### Useful Value Sets

Many questions have a set of possible codes for their answer. These value sets may be useful to help, and when referenced by full URL, do not need to be provided as part of the questionnaire:

* [Yes | No | Don't Know](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\valueset-example-yesnodontknow.html): http://hl7.org/fhir/ValueSet/yesnodontknow

### Questions with multiple answer types

In some questionnaires, it may be possible to respond to a question with multiple types of answers. For example, capturing a coded answer plus free text, capturing a coded value plus a numeric priority, etc. In FHIR, this is handled through nested questions. Each question has a single data type. However, each question can have nested child questions. These nested child questions can have text (e.g. "Please specify") or can have no text at all if the appropriate guidance is provided by the parent question or group.

### Questionnaires with Math

While not defined (yet) at the international level, extensions may be defined to perform mathematical functions on questionnaire responses. For example, tabulating scores. One extension that is defined that may be useful in this process is the Ordinal extension. This allows a numeric value to be associated with a coded data element. There are two extensions defined - one for defining the numeric weighting of a code defined in a value set - [valueset-ordinalValue](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\extension-valueset-ordinalvalue.html) and the other is a code that can appear within a Coding itself - [iso21090-CO-value](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\extension-iso21090-co-value.html).

### Extensions for Additional capabilities

The core elements defined in the questionnaire resource are sufficient for simple questionnaires. For more sophisticated capabilities, a number of "common" extensions are defined in the [Questionnaire Core extensions](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\questionnaire-extensions.html) and the [Element extensions](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\element-extensions.html) profiles. For example, strict control over allowed number of conditions, conditional display of questionnaire content, etc. The conditional display extension [enable-when] can be used to enable groups nested beneath a question based on the selection of a specific answer, giving the behavior of "questions under answers" where this sort of more sophisticated behavior is needed.

# source\questionnaireresponse\questionnaireresponse-examples-header.xml

# source\questionnaireresponse\questionnaireresponse-introduction.xml

## Scope and Usage

**QuestionnaireResponse** provides a complete or partial list of answers to a set of questions filled when responding to a questionnaire. The questions may be included directly or by reference to a [Questionnaire](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\questionnaire.html) resource that defines the questions as well as the constraints on the allowed answers. In some cases, both may be provided to provide both formal rules for editing the questionnaire (via link to [Questionnaire](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\questionnaire.html)) as well as sufficient local information to allow rendering of the questionnaire.

Each time a questionnaire is completed for a different subject or at a different time, a distinct QuestionnaireResponse is generated, though it may be possible for a previously entered set of answers to be edited or updated.

Questionnaires cover the need to communicate data originating from forms used in medical history examinations, research questionnaires and sometimes full clinical specialty records. In many systems this data is collected using user-defined screens and forms. Questionnaires record specifics about data capture - exactly what questions were asked, in what order, what choices for answers were, etc. Each of these questions is part of the Questionnaire, and as such the Questionnaire is a separately identifiable Resource, whereas the individual questions are not.

Examples of Questionnaires include:

* Past medical history (PMH)
* Family diseases
* Social history
* Research questionnaires and Case report forms (CRFs)
* Quality and evaluation forms
* Patient intake form (e.g. clipboard)
* Insurance claim form

**QuestionnaireResponse** can be validated against their corresponding [Questionnaire](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\questionnaire.html) to verify that required groups and questions are answered and that answers fit constraints in terms of cardinality, data type, etc.

## Boundaries and Relationships

The **QuestionnaireResponse** resource captures the responses to a questionnaire, while [Questionnaire](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\questionnaire.html) represents the definition of the questionnaire form, including what questions are asked, how they're organized and the constraints on the allowed answers.

While [Observation](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\observation.html), with its nested relatedObservation structure, can create complex hierarchies of questions and answers, the focus is different. First, [Observation](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\observation.html) is used primarily for capturing data elements that are "true" observations - lab measurements, vital signs, social assessments, etc. On the other hand, **QuestionnaireResponse** can be used to capture any types of data, including data that would typically map to other resources ([Procedure](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\procedure.html), [Patient](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\patient.html), [MedicationStatement](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\medicationstatement.html), etc.) In addition, the focus of **QuestionnaireResponse** includes the specific phrasing and organization of the questions. All data must be explicitly captured as a question. With [Observation](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\observation.html), the focus is only on the meaning of the answer, not what question was asked (assuming a question was even asked at all). Additional information such as normal ranges, interpretation, date, etc. may also be captured.

# source\questionnaireresponse\questionnaireresponse-notes.xml

## Notes

* Questionnaires can be authored by clinicians, the patient his/herself or a patient's relatives (or even owner in the case of animals). Clinicians may author questionnaires, where the answers are provided by others on behalf of the patient his/herself. Additionally, information gathered for the purpose of a patient may be about the patient's relatives (e.g. in family anamnesis). Therefore, Questionnaire makes a distinction between the author, the subject and the source of information.
* A QuestionnaireResponse may be stand-alone or may point to the form that defines the questions in [Questionnaire](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\questionnaire.html). In this second case, the linkage between the questions and groups in the two resources is established using the linkId element.
* Because of the lack of explicit support for Questionnaires in HL7v3, HL7 CDA Documents frequently used named sections with Observations to model Questionnaires. Such use cases should now utilize the QuestionnaireResponse Resource instead.
* The Questionnaire's *encounter* element can be used to link to the encounter during which the Questionnaire was taken. This can be relevant since the encounter gives context to the answers and can be used to relate information in the Questionnaire to orders and observations that were done during the same Encounter.
* The order of questions within groups, groups within groups and groups within questions is relevant and must be retained for display and capture.

Refer to additional guidance provided in the [Questionnaire](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\questionnaire.html) resource dealing with designs of questionnaires.

## Security

QuestionnaireResponse can have answers with values of type Attachment. These attachments will typically be selected by the user answering the questionnaire and this selection may be done in an uncontrolled environment. Systems should ensure that the attachment is of the desired type and take precautions before rendering or executing any attached content.

## Access Control

For most resources, the type of information that can be conveyed in the resource is determined by the resource and the key attributes that determine the sensitvity level of the information are also known. E.g. drug, observation type, clinical trial randomaization status, etc. However, for QuestionnaireResponse, the sensitivity of an instance is dependent on what type of Questionnaire it's associated with. And the data elements that determine that sensitivity could be the answers to any of the questions. This makes automatically enforcing access control rules more challenging. Designers should take these challenges into account and may need to place stricter access controls around QuestionnaireResponse to ensure that access to information is not granted improperly.

# source\referralrequest\referralrequest-examples-header.xml

# source\referralrequest\referralrequest-introduction.xml

## Scope and Usage

This resource is used to share relevant information required to support a referral request or a transfer of care request from one practitioner or organization to another. It is intended for use when a patient is required to be referred to another provider for a consultation/second opinion and/or for short term or longer term management of one or more health issues or problems.

Examples include:

* Request for a consult from a specialist
* Referral for support from community services
* District nursing services referral
* Request for Aged care placement assessment
* Request for a pharmacist medication review
* Referral for physiotherapy or occupational therapy

ReferralRequest is also intended for use when a complete and more permanent transfer of care responsibility from one practitioner/organization to another. For example as in the case of requesting the transfer of care for a patient from an acute care setting to rehabilitation, aged care, or skilled nursing facility.

## Boundaries and Relationships

ReferralRequest is closely related to other types of "request" resources, particularly [DiagnosticOrder](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\diagnosticorder.html) and [ProcedureRequest](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\procedurerequest.html). In fact, for some services, it may be appropriate to use any one of these resources to request that the service be performed. Which one is used may be driven by organization practice and by context. When it is unclear which to use, the following principles may be helpful:

* ProcedureRequest or DiagnosticOrder are typically used when the requesting clinician has and wishes to exercise the authority (and expertise) to decide exactly what action will be done.
* A ReferralRequest is used when the requesting practitioner is seeking another practitioner or organization to use their own expertise and/or authority to determine the specific action to take.
* Whether an activity is deemed to be a procedure or only a diagnostic order is typically driven by how invasive the diagnostic process is. More invasive processes are typically represented as procedures, though the dividing line may vary by organization.

Irrespective of the guidance above, systems should be prepared for some degree of overlap between these resources and be prepared to execute searches against multiple resources in cases where differentiation cannot be guaranteed. As well, in some workflows more than one type of resource or even all three might exist. E.g. Upon receiving a ReferralRequest a practitioner might initiate a DiagnosticOrder. The diagnostic service might then initiate a ProcedureRequest.

A "referral" is often thought of as a document that contains a great deal of information about the patient being referred. This resource does not actually contain the clinical background information for the patient. Instead, it supports references to the numerous other resources that define this information. For example, Condition, Family History, Allergy/Intolerance, Alerts, Medication, Diagnostic Reports, etc. While some systems may choose to bundle up a ReferralRequest and this referenced information into a [Document](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\documents.html) for delivery to the recipient. However, [REST](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\http.html), [Messaging](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\messaging.html) and [Services](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\services.html) are also valid architectures for managing referrals and may be more appropriate where active workflow management is needed.

The details of the type of care desired as part of a referral may be conveyed using any of the "request" or "order" resources, likely with a status of "proposed". The [CarePlan](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\careplan.html) resource can be used to describe more sophisticated requests for combinations of services. Likewise, ReferralRequest may be referenced as part of a CarePlan.

A ReferralRequest may be targeted (identifying a specific Practitioner or Organization to perform the requested care) or untargeted (merely identifying the type of care desired). The [Order](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\order.html) and [OrderResponse](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\orderresponse.html) resources may be used to help manage such workflows.

A ReferralRequest might be fulfilled by a [DiagnosticReport](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\diagnosticreport.html), [Encounter](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\encounter.html), [Procedure](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\procedure.html), or other assessment-related resource.

A ReferralRequest should not be confused with an [Appointment](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\appointment.html) as appointments are intended for booking/scheduling purposes.

# source\referralrequest\referralrequest-notes.xml

# source\medication\medication-examples-header.xml

# source\medication\medication-introduction.xml

## Scope and Usage

Representing Medication in the majority of healthcare settings is a matter of identifying an item from a list and then conveying a reference for the item selected either into a patient related resource or to other applications. Additional information about the medication is frequently provided for human verification but a full representation of the details of composition and efficacy of the medicine is conveyed by referring to drug dictionaries by means of the codes they define. There are some occasions where it is necessary to identify slightly more detail, such as when dispensing a package containing a particular medicine requires identification both of the medicine and the package at once. There are also some occasions (e.g. custom formulations) where the composition of a medicine must be represented. In these cases the ingredients of the medicine have to be specified together with the amount contained, though the medication resource does not provide full details.

The medication resource allows for medications to be characterised as either a product or a package; this classification is important because it affects the interpretation of a prescribed amount. For instance, is the prescribed amount 20 tablets, or 20 packages of 50 tablets each?

Depending on whether the medication is a product or a package, further details about the composition can be provided. A product has a form (tablet, suspension, etc.) and a list of ingredients with quantities. The ingredients may be other medications or substances. A package has a container (vacuum packed box, jar, etc.) and a list of the products or other packages that are in the package.

# source\medication\medication-notes.xml

# source\medicationadministration\medicationadministration-examples-header.xml

# source\medicationadministration\medicationadministration-introduction.xml

## Scope and Usage

This resource covers the administration of all medications and vaccines. Please refer to the [Immunization](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\immunization.html) Resource/Profile for the treatment of vaccines. It will principally be used within care settings (including inpatient) to record the capture of medication administrations including self-administrations of oral medications, injections, intra-venous adjustments, etc. It can also be used in out-patient settings to record allergy shots and other non-immunization administrations. In some cases it might be used for home-health reporting, such as recording self-administered or even device-administered insulin.

## Boundaries and Relationships

**The Medication domain includes a number of related resources**

|  |  |
| --- | --- |
| [MedicationOrder](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\medicationorder.html) | An order for both supply of the medication and the instructions for administration of the medicine to a patient. |
| [MedicationDispense](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\medicationdispense.html) | Provision of a supply of a medication with the intention that it is subsequently consumed by a patient (usually in response to a prescription). |
| MedicationAdministration | When a patient actually consumes a medicine, or it is otherwise administered to them |
| [MedicationStatement](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\medicationstatement.html) | This is a record of medication being taken by a patient, or that the medication has been given to a patient where the record is the result of a report from the patient, or another clinician. A medication statement is not a part of the prescribe->dispense->administer sequence but is a report that such a sequence (or at least a part of it) did take place resulting in a belief that the patient has received a particular medication. |

**MedicationAdministration** is intended for tracking the administration of non-vaccine medications. Administration of vaccines is intended to be handled using the [Immunization](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\immunization.html) resource. Some systems treat immunizations in the same way as any other medication administration. Such systems SHOULD use an immunization resource to represent these. If systems need to use a **MedicationAdministration** resource to capture vaccinations for workflow or other reasons, they SHOULD also create and expose an equivalent [Immunization](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\immunization.html) instance.

# source\medicationadministration\medicationadministration-notes.xml

## Known Issues

|  |  |
| --- | --- |
| **Issue** | **Comments** |
| Medication Resource | A medication will typically be referred to by means of a code drawn from a suitable Medicines Terminology. However on occasion a product will be required for which the "recipe" must be specified. This implies a requirement to deal with a choice of either a code or a much more complete resource. Currently that resource has not been created. |
| Encounter | Administration records are usually tied to some wider grouping of care records. Encounter or Episode of Care is a common name for this. The present MedicationAdministration resource (and the other three yet to be built) link to an Encounter as an identifier, but it may be more appropriate for it to be a full resource. |
| Contrast Media | Is this resource adequate for administering contrast media to a patient? |
| Author (accountability) | Authorship (and any other accountability) is assumed to be dealt with by the standard FHIR methods. |

# source\medicationdispense\medicationdispense-examples-header.xml

# source\medicationdispense\medicationdispense-introduction.xml

## Scope and Usage

This resource covers the supply of medications to a patient. Examples include dispensing and pick-up from an out-patient or community pharmacy, dispensing patient-specific medications from in-patient pharmacy to ward as well as issuing a single dose from ward stock to a patient for consumption. The medication dispense is the result of a Pharmacy system responding to a Medication Order.

## Boundaries and Relationships

**The Medication domain includes a number of related resources**

|  |  |
| --- | --- |
| [MedicationOrder](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\medicationorder.html) | An order for both supply of the medication and the instructions for administration of the medicine to a patient. |
| MedicationDispense | Provision of a supply of a medication with the intention that it is subsequently consumed by a patient (usually in response to a prescription). |
| [MedicationAdministration](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\medicationadministration.html) | When a patient actually consumes a medicine, or it is otherwise administered to them |
| [MedicationStatement](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\medicationstatement.html) | This is a record of medication being taken by a patient, or that the medication has been given to a patient where the record is the result of a report from the patient, or another clinician. A medication statement is not a part of the prescribe->dispense->administer sequence but is a report that such a sequence (or at least a part of it) did take place resulting in a belief that the patient has received a particular medication. |

This resource does not deal with the supply or transfer of non-medication related items to a patient.

## Background and Context

The supply and the associated administration instructions may not exactly follow the original order (prescription) either because some details were left for completion at this point in the process, or because the dispenser exercised their clinical judgment to make some appropriate modification.

# source\medicationdispense\medicationdispense-notes.xml

# source\medicationstatement\medicationstatement-examples-header.xml

# source\medicationstatement\medicationstatement-introduction.xml

## Scope and Usage

Common usage includes:

* the recording of non-prescription and/or recreational drugs
* the recording of an intake medication list upon admission to hospital
* the summarization of a patient's "active medications" in a patient profile

This resource does not produce a medication list, but it does produce individual medication statements that may be used in the List resource to construct various types of medication lists. Note that other medication lists can also be constructed from the other Pharmacy resources e.g. Medication Order, Medication Administration.

A medication statement is not a part of the prescribe â€“> dispense -> administer sequence, but is a report by a patient, significant other or a clinician that one or more of the prescribe, dispense or administer actions has occurred, resulting is a belief that the patient is, has, or will be using a particular medication.

## Boundaries and Relationships

**The Medication domain includes a number of related resources**

|  |  |
| --- | --- |
| [MedicationOrder](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\medicationorder.html) | An order for both supply of the medication and the instructions for administration of the medicine to a patient. |
| [MedicationDispense](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\medicationdispense.html) | Provision of a supply of a medication with the intention that it is subsequently consumed by a patient (usually in response to a prescription). |
| [MedicationAdministration](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\medicationadministration.html) | When a patient actually consumes a medicine, or it is otherwise administered to them |
| MedicationStatement | This is a record of medication being taken by a patient, or that the medication has been given to a patient where the record is the result of a report from the patient, or another clinician. A medication statement is not a part of the prescribe->dispense->administer sequence but is a report that such a sequence (or at least a part of it) did take place resulting in a belief that the patient has received a particular medication. |

This resource is distinct from [MedicationOrder](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\medicationorder.html), [MedicationDispense](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\medicationdispense.html) and [MedicationAdministration](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\medicationadministration.html). Each of those resources refer to specific events - an individual order, an individual provisioning of medication or an individual dosing. MedicationStatement is a broader assertion covering a wider timespan and independent of specific events. The existence of resource instances of any of the preceding three types may be used to infer a Medication statement. However, medication statements can also be captured on the basis of other information including an assertion by the patient or a care-giver, the results of a lab test, etc.

# source\medicationstatement\medicationstatement-notes.xml

# source\immunization\immunization-examples-header.xml

# source\immunization\immunization-introduction.xml

## Scope and Usage

The immunization resource is intended to cover the recording of current and historical administration of vaccines to patients across all healthcare disciplines in all care settings and all regions. This includes immunization of both humans and animals but does not include the administration of non-vaccine agents, even those that may have or claim immunological effects.

Additionally, the immunization resource is expected to cover key concepts related to the creation, revision and querying of a patient's immunization history. This resource - through consultation with the PHER work group - is believed to meet key use cases and information requirements as defined in the existing HL7 v2.x immunization implementation guide, HL7 v3 POIZ domain and Immunization Domain Analysis Model.

## Boundaries and Relationships

This resource references the following resources:

* Patient
* Practitioner
* Organization
* Location
* Observation
* Encounter

Administration of vaccines is intended to be handled using the **Immunization** resource. [MedicationAdministration](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\medicationadministration.html) is intended for tracking the administration of non-vaccine medications. Some systems treat immunizations in the same way as any other medication administration. Such systems SHOULD use an immunization resource to represent these. If systems need to use a [MedicationAdministration](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\medicationadministration.html) resource to capture vaccinations for workflow or other reasons, they SHOULD also expose an equivalent **Immunization** instance.

**AllergyIntolerance and Immunization.reaction**

[Immunization.reaction](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\immunization-definitions.html#Immunization.reaction) may be an indication of an allergy or intolerance. If this is deemed to be the case, a separate [AllergyIntolerance](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\allergyintolerance.html) record should be created to indicate it, as most systems will not query against past Immunization.reaction.

# source\immunization\immunization-notes.xml

# source\immunizationrecommendation\immunizationrecommendation-examples-header.xml

# source\immunizationrecommendation\immunizationrecommendation-introduction.xml

## Scope and Usage

The ImmunizationRecommendation resource is intended to cover communication of a specified patient's immunization recommendation and status across all healthcare disciplines in all care settings and all regions.

Additionally, the ImmunizationRecommendation resource is expected to cover key concepts related to the querying of a patient's immunization recommendation and status. This resource - through consultation with the PHER work group - is believed to meet key use cases and information requirements as defined in the existing HL7 v3 POIZ domain and Immunization Domain Analysis Model.

## Boundaries and Relationships

This resource references the following resources:

* Allergy/Intolerance
* Patient
* Organization
* Immunization
* Observation

One of the considerations for this resource is if it is better for this resource to be a profile of the CarePlan resource or if it is more appropriate for this to be a separate resource due to the number of immunization profile-specific data elements. Please consider this when submitting your ballot comments.

# source\immunizationrecommendation\immunizationrecommendation-notes.xml

# source\auditevent\auditevent-examples-header.xml

# source\auditevent\auditevent-introduction.xml

## Scope and Usage

The audit event is based on the IHE-ATNA Audit record definitions, originally from [RFC 3881](http://tools.ietf.org/html/rfc3881), and now managed by DICOM (see [DICOM Part 15 Annex A5](http://medical.nema.org/medical/dicom/current/output/html/part15.html#sect_A.5)).

* ASTM E2147 â€“ Setup the concept of security audit logs for healthcare including accounting of disclosures
* IETF RFC 3881 â€“ Defined the Information Model (IETF rule forced this to be informative)
* DICOM Audit Log Message â€“ Made the information model Normative, defined Vocabulary, Transport Binding, and Schema
* IHE ATNA â€“ defines the grouping with secure transport and access controls; and defined specific audit log records for specific IHE transactions.
* NIST SP800-92 â€“ shows how to do audit log management and reporting â€“ consistent with our model
* HL7 PASS â€“ Defined an Audit Service with responsibilities and a query interface for reporting use
* ISO 27789 â€“ Defined the subset of audit events that an EHR would need

This resource is managed collaboratively between HL7, DICOM, and IHE.

The primary purpose of this resource is the maintenance of security audit log information. However, it can also be used for any audit logging needs and simple event-based notification.

## Background and Context

Servers that provide support for Audit Event resources would not generally accept update or delete operations on the resources, as this would compromise the integrity of the audit record. Access of the AuditEvent would typically be limited to Security office, Privacy office, or other Systems Administration purposes. The AuditEvent is not intended to be used directly by Providers or Patients, although reports generated from the raw data would be useful. An example is a Patient centric Accounting of Disclosures or an Access Report.

All actors involved in an auditable event should record an AuditEvent (See Audit Event Sub-Type vocabulary for guidance on some security relevant events). This would result in duplicate AuditEvent entries which show the properly working system of systems. Thus it is typical to get an auditable event recorded by both the application, and server. I this way duplicate entries are expected, this is helpful because detecting when only one actor records that an auditable event is an indication of a security problem. There may be non-participaing actors that also detect a security relevant event and thus would record an AuditEvent, such as a trusted intermediary.

Security Relevant events are not limited to communications or RESTful events. They include software startup and shutdown; user login and logout; access control decisions; configuration events; software installation; policy rules changes; and manipulation of data that exposes the data to users.

Audit Event resources are often (though not exclusively) created by the application responding to the create/read/query/update/delete/execute etc. event. A [Provenance resource](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\provenance.html) contains overlapping information, but is a record-keeping assertion that gathers information about the context in which the information in a resource was obtained. Provenance resources are prepared by the application that initiates the create/update of the resource.

# source\auditevent\auditevent-notes.xml

### Using Coded Values

The audit event resource and the ATNA Audit record are used in many contexts through healthcare. The coded values defined in the "extensible" bindings above are those widely used and/or defined by DICOM, IHE or ISO, who all defined these codes to meet very specific use cases. These codes should be used when the are suitable, or other codes can be defined.

The set of codes defined for this resource are expected to grow over time, and additional codes may be proposed / requested using the community input link above.

### Event codes for Common Scenarios

This table summarizes common event scenarios, and the codes that should be used for each case.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Scenario** | **type** | **subtype** | **action** | Other |
| User Login ([example](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\auditevent-examples.html)) | [110114](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\valueset-dicom-dcim.html#110114) User Authentication | [110122](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\valueset-dicom-dcim.html#110122) User Authentication | [E](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\valueset-audit-event-action.html) Execute | One participant which contains the details of the logged in user |
| User Logout ([example](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\auditevent-examples.html)) | [110114](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\valueset-dicom-dcim.html#110114) User Authentication | [110123](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\valueset-dicom-dcim.html#110123) User Logout | [E](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\valueset-audit-event-action.html) Execute | One participant which contains the details of the logged out user |
| REST operation logged on server ([example](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\auditevent-examples.html)) | [rest](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\valueset-audit-event-type.html) RESTful Operation | [[code]](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\valueset-type-restful-interaction.html) defined for operation | [\*](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\valueset-audit-event-action.html) (see below) | Participant for logged in user, if available, and one object with a reference if at least the type is known as part of the operation. Reference.url should be provided to the granularity known |
| Search operation logged on server ([example](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\audit-event-example-search.html)) | [rest](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\valueset-audit-event-type.html) RESTful Operation | [[code]](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\valueset-type-restful-interaction.html) defined for operation | [E](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\valueset-audit-event-action.html) Execute | Participant for logged in user, if available, and one object with a query element. |

Audit Event Actions for RESTful operations:

|  |  |
| --- | --- |
| **Operation** | **Action** |
| create | C |
| read, vread, history-instance, history-type, history-system | R |
| update | U |
| delete | D |
| transaction, operation, conformance, validate, search, search-type, search-system | E |

# source\provenance\provenance-examples-header.xml

# source\provenance\provenance-introduction.xml

## Scope and Usage

The provenance resource tracks information about the activity that created a version of a resource, including the entities, and agents involved in producing a resource. This information can be used to form assessments about its quality, reliability or trustworthiness, or to provide pointers for where to go to further investigate the origins of the resource and the information in it.

[Provenance resources](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\provenance.html) are a record-keeping assertion that gathers information about the context in which the information in a resource was obtained. Provenance resources are prepared by the application that initiates the create/update etc. of the resource. A [Audit Event](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\auditevent.html) resource contains overlapping information, but is created as events occur, to track and audit the events. Audit Event resources are often (though not exclusively) created by the application responding to the read/query/create/update etc. event.

## Boundaries and Relationships

Many other FHIR resources contain some elements that represent information about how the resource was obtained, and therefore they overlap with the functionality of the Provenance resource. These properties in other resources should always be used in preference to the provenance resource, and the provenance resource should be used where additional information is required, though overlap can occur.

## Background and Context

The provenance resource is based on the [W3C Provenance specification](http://www.w3.org/TR/2013/NOTE-prov-overview-20130430/), and mappings are provided. The Provenance resource is tailored to fit the FHIR use-cases for provenance more directly. In terms of [W3C Provenance](http://www.w3.org/TR/prov-dm/) the FHIR [Provenance resources](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\provenance.html) covers "Generation" of "Entity" with respect to FHIR defined Resources for creation or updating; where as [Audit Event](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\auditevent.html) covers "Usage" of "Entity" and all other "Activity" as defined in W3C Provenance.

The W3C Provenance Specification has the following fundamental model:

Where:

* Target - An Entity that is a FHIR Resource instance that is Created, Updated, or Deleted.
* Entity - An entity is a physical, digital, conceptual, or other kind of thing with some fixed aspects; entities may be real or imaginary.
* Agent - An agent is something that bears some form of responsibility for an activity taking place, for the existence of an entity, or for another agent's activity.
* Activity - An activity is something that occurs over a period of time and acts upon or with entities; it may include consuming, processing, transforming, modifying, relocating, using, or generating entities.

The *Provenance* resource actually corresponds to a single activity that identifies a set of resources (*target*) generated by the activity. The activity also references other entities (*entity*) that were used and the agents (*agent*) that were associated with the activity.

# source\provenance\provenance-notes.xml

### Using the Provenance Resource

The provenance resource identifies information about another resource (the *reference* element). The provenance resource may be used in several different ways:

* As part of a [document bundle](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\documents.html) where it identifies the provenance of part or all of the document
* On a [RESTful system](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\http.html) where it keeps track of provenance information relating to resources

When used in a document bundle, the *references* are often not explicitly versioned, but they always implicitly pertain to the version of the resource found in the document. On a RESTful system, the target resource reference should be version specific, but this requires special care: For new resources that need to have a corresponding Provenance resource, the version-specific reference is often not knowable until after the target resource has been updated. This can create an integrity problem for the system - what if the provenance resource cannot be created after the target resource has been updated? To avoid any such integrity problems, the target resource and the provenance resources should be submitted as a pair using a [transaction](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\http.html#transaction).

### Digital Signatures

The provenance resource includes a Digital Signature element which can be used for standards based integrity verification, and non-repudiation purposes. The *Signature* datatype provides details on use of the Signature element. The purposeOfSignature of "source" should be used when the signature is for simply proving that the Resource content is the same as it was when the resource was updated or created.

### Party References

Because the Provenance resource often refers to parties that are not represented as FHIR resources, Agent and Entity references are allowed to be either references to other resources, or they can refer to other entities that are not FHIR resources.

The code in the *.type* element is used to differentiate between the two: if the code is in the system "http://hl7.org/fhir/resource-types", then the reference is to a resource, and the element *reference* functions exactly the same as in a [Resource Reference](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\references.html#references).

A version specific reference to a FHIR resource on the same server:

<agent>

<type>

<system value="http://hl7.org/fhir/resource-types"/>

<code value="Patient"/>

</type>

<reference value="Patient/34/\_history/3"/>

</agent>

In effect, this is the same pattern as a standard resource reference, but the type becomes extensible to allow referencing other kinds of resources.

A reference to a user (a person) not represented by a FHIR resource:

<agent>

<type>

<system value="http://hl7.org/fhir/provenance-participant-type"/>

<code value="person"/>

</type>

<reference value="http://acme.com/users/34"/>

</agent>

One subtle issue with the use of the Provenance resource is to differentiate between whether the reference is to the Resource itself, or whether the the reference is to the real world thing that the resource represents, e.g. was it the person involved in the activity, or the record of the person. For Agents, it should be understood that the reference is to the real world thing that the resource represents.

# source\composition\composition-examples-header.xml

# source\composition\composition-introduction.xml

## Scope and Usage

A Composition is also the basic structure from which [FHIR Documents](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\documents.html) - immutable bundles with attested narrative - are built. A single logical composition may be associated with a series of derived documents, each of which is a frozen copy of the composition.

Note: [EN 13606](http://en.wikipedia.org/wiki/EN_13606) uses the term "Composition" to refer to a single commit to an EHR system, and offers some common examples: a composition containing a consultation note, a progress note, a report or a letter, an investigation report, a prescription form or a set of bedside nursing observations. Using Composition for an attested EHR commit is a valid uses of the Composition resource, but for FHIR purposes, it would be usual to make more granular updates with individual provenance statements.

## Boundaries and Relationships

Composition is a structure for grouping information for purposes of persistance and attestability. There are several other grouping structures in FHIR with distinct purposes:

* The [List](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\list.html) resource - enumerates a flat collection of resources and provides features for managing the collection. While a particular List instance may represent a "snapshot", from a business process perspective the notion of "List" is dynamic â€“ items are added and removed over time. The list resource references other resources. Lists may be curated and have specific business meaning.
* The [Group](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\group.html) resource - defines a group of specific people, animals, devices, etc. by enumerating them, or by describing qualities that group members have. The group resource refers to other resources, possibly implicitly. Groups are intended to be acted upon or observed as a whole. E.g. performing therapy on a group, calculating risk for a group, etc. This resource will commonly be used for public health (e.g. describing an at-risk population), clinical trials (e.g. defining a test subject pool) and similar purposes.
* The [Bundle](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\bundle.html) resource is an infrastructure container for a group of resources. It does not have narrative and is used to group collections of resources for transmission, persistence or processing (e.g. messages, documents, transactions, query responses, etc.) The content of bundles is typically algorithmically determined for a particular exchange or persistence purpose.
* The [Composition](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\composition.html) resource â€“ defines a set of healthcare-related information that is assembled together into a single logical document that provides a single coherent statement of meaning, establishes its own context and that has clinical attestation with regard to who is making the statement. The composition resource provides the basic structure of a FHIR [document](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\documents.html). The full content of the document is expressed using a bundle containing the Composition and its entries.

The Composition resource organizes clinical and administrative content into sections, each of which contains a narrative, and references other resources for supporting data. The narrative content of the various sections in a Composition are supported by the resources referenced in the section entries. The complete set of content to make up a document includes the Composition resource together with various resources pointed to or indirectly connected to the Composition all gathered together into a [Bundle](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\bundle.html) for transport and persistence. The following list of Composition references SHALL be included in the bundle:

Other resources referred to by those resources may be included in the bundle at the discretion of the authoring system, or as specified by any applicable profiles.

## Background and Context

### Composition Status Codes

Every composition has a status, which describes the status of the content of the composition, taken from this list of codes:

|  |  |
| --- | --- |
| **Code** | **Definition** |
| preliminary | This is a preliminary composition (also known as initial or interim). The content may be incomplete or unverified. |
| final | The composition is complete and verified by an appropriate person and no further work is planned |
| appended | The composition has been modified subsequent to being marked and/or released as "final" and is complete and verified by an authorized person. The modifications added new information to the composition, but did not revise existing content |
| amended | The composition content or the referenced resources have been modified subsequent to being released as "final" and the composition is complete and verified by an authorized person |
| retracted | The composition was originally created/issued in error and this is an amendment that marks that the entire composition and any past versions or copies should not be considered as valid |

Composition status generally only moves down through this list - it moves from preliminary to final and then it may progress to either appended or amended. Note that in many workflows, only final compositions are made available and the preliminary status is not used.

A very few compositions are created entirely in error in the workflow - usually the composition concerns the wrong patient or is written by the wrong author, and the error is only detected after the composition has been used or documents have been derived from it. To support resolution of this case, the composition is updated to be marked as "retracted" and a new derived document can be created. This means that the entire series of derived documents is now considered to be created in error and systems receiving derived documents based on retracted compositions SHOULD remove data taken from earlier documents from routine use and/or take other appropriate actions. Systems are not required to provide this workflow or support documents derived from retracted compositions, but they SHALL NOT ignore a status of retracted. Note that systems that handle compositions or derived documents and don't support the retracted status need to define some other way of handling compositions that are created in error; while this is not a common occurrence, some clinical systems have no provision for removing erroneous information from a patient's record and there is no way for a user to know that it is not fit for use - this is not safe.

### Note for CDA aware readers

Many users of this specification are familiar with the [Clinical Document Architecture](http://www.hl7.org/implement/standards/product_brief.cfm?product_id=7) (CDA) and related specifications. CDA is a primary design input to the composition resource (other principle inputs are other HL7 document specifications, and EN13606). There are two important structural differences between CDA and the composition resource:

* A composition is a logical construct- its identifier matches to the CDA ClinicalDocument.setId. Composition resources are wrapped into [Document](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\documents.html) structures, for exchange of the whole package (the composition and its parts), and this wrapped, sealed entity is equivalent to a CDA document, where the Bundle.id is equivalent in function to ClinicalDocument.id (but not identical, if interconverting, since it's a transform between them)
* The composition section defines a section (or sub-section) of the document, but unlike in CDA, the section entries are actually references to other [resources](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\resourcelist.html) that hold the supporting data content for the section. This design means that the data can be reused in many other ways.
* Unlike CDA, the context defined in the Composition - the confidentiality, subject, author, event and event period and encounter apply to the composition and do not specifically apply to the resources referenced from the section.entry. There is no context flow model in FHIR, so each resource referenced from within a composition expresses its own individual context. In this way, clinical content can safely be extracted from the Composition.

In addition, note that both the code lists (e.g. [Composition status](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\valueset-composition-status.html)) and the composition resource are [mapped](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\composition-mappings.html) to v3 and/or CDA.

# source\composition\composition-measurereport-profile-introduction.xml

### Introduction

This project is to create a Measure Report FHIR Profile to represent aggregate measure scores and allows for drill down into the data that is used to determine the measure scores. This specification aims to focus on the needs of international implementer community and not focus on solely on US quality reporting needs. The Measure Report FHIR Profile should be compatible with the new harmonized Health Quality Improvement specifications.

The project aims to target implementers who may not use QRDA for exchanging data on measure reports.

This profile also aims to accomplish the following:

Explore representing measure reports using FHIR

Represent aggregate measure scores with break downs

Explore different levels of drill down

Provide examples of components in this profile and QRDA

Document improvements with QRDA

Benefits of being able to RESTfully query measure reports using FHIR

# source\composition\composition-notes.xml

## Notes:

* The author and the attester are often the same person, but this may not be the case in some clinical workflows
* The attester attests contents of the document resource, the subject resource and the resources referred to in the Composition.section.content references. Because documents are often derived Compositions and the attestation from the composition is held to apply to the document, the method for [presenting a document](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\documents.html#presentation) should be used when/if attesters review the content of the composition
* The custodian is responsible for the maintenance of the composition and any documents derived from it. With regard to the documents, they are responsible for the policy regarding persistence of the documents. Although they need not actually retain a copy of the document, they SHOULD do so.

**DSTU Note:** Feedback is welcome on two issues related to Composition:

* For many compositions, the title is the same as the text or a display name of Composition.type (e.g. a \"consultation\" or \"progress note\"). Note that CDA does not make title mandatory, but there are no known cases where it is useful for title to be omitted, so it is mandatory here during the trial use period
* A client can ask a server to generate a fully bundled document from a composition resource using the $generate operation. This operation definition does not resolve the question how document signatures are created. This is an open issue during the period of trail use, and feedback is requested regarding this question

Feedback [here](http://wiki.hl7.org/index.php?title=FHIR_Specification_Feedback_(DSTU_2)).

# source\documentmanifest\documentmanifest-examples-header.xml

# source\documentmanifest\documentmanifest-introduction.xml

## Scope and Usage

A document manifest gathers a set of [Document Reference](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\documentreference.html) resources into a single package that may be the subject of workflow such as access control, auditing, and targeted delivery.

Typically, Document Manifest Resources are used in document indexing systems, such as [IHE XDS](http://wiki.ihe.net/index.php?title=Cross-Enterprise_Document_Sharing) (see the [XDS specific profile](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\xds.html)).

# source\documentmanifest\documentmanifest-notes.xml

# source\documentreference\documentreference-examples-header.xml

# source\documentreference\documentreference-introduction.xml

## Scope and Usage

A document reference resource is used to describe a document that is made available to a healthcare system. A document is some sequence of bytes that is identifiable, establishes its own context (e.g. what subject, author etc), can be displayed to the user, and has defined update management. The DocumentReference resource can be used with any document format that has a recognized mime type, and that conforms to this definition.

Typically, Document Reference Resources are used in document indexing systems, such as [IHE XDS](http://wiki.ihe.net/index.php?title=Cross-Enterprise_Document_Sharing) (see the [XDS specific profile](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\xds.html)), and are used to refer to:

* [CDA documents](http://www.hl7.org/implement/standards/product_brief.cfm?product_id=7) in FHIR systems
* [FHIR documents](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\documents.html) stored elsewhere (i.e. registry/repository following the XDS model)
* [PDF documents](http://en.wikipedia.org/wiki/Portable_Document_Format), and even digital records of faxes where sufficient information is available
* Other kinds of documents, such as records of prescriptions.

## Boundaries and Relationships

FHIR defines both a [document format](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\documents.html) and this document reference. FHIR documents are for documents that are authored and assembled in FHIR. This resource is mainly intended for general references to other documents.

The document that is a target of the reference can be a reference to a FHIR document served by another server, or the target can be stored in the special [FHIR Binary Resource](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\http.html#binary), or the target can be stored on some other server system. The document reference is also able to address documents that are retrieved by a service call such as an XDS.b RetrieveDocumentSet, or a DICOM exchange, or a v2 message query, though the way each of these service calls works must be specified in some external standard or other documentation.

A DocumentReference describes some other document. This means that there are two sets of provenance information relevant here: the provenance of the document, and the provenance of the document reference. Sometimes, the provenance information is closely related, as when the document producer also produces the DocumentReference, but in other workflows, the document reference is generated later by other actors. In the DocumentReference resource, the [meta](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\resource.html#Meta) content refers to the provenance of the reference itself, while the content described below concerns the document it references. Like all resources, there is overlap between the information in the resource directly, and in the general [Provenance](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\provenance.html) resource. This is discussed as [part of the description of the Provenance resource](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\provenance.html#overlap).

# source\documentreference\documentreference-notes.xml

## Implementation Notes

* The use of the .docStatus codes is discussed in the [Composition description](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\composition.html#status)
* The resources maintain one way relationships that point backwards - e.g. the document that replaces one document points towards the document that it replaced. The reverse relationships can be followed by using indexes built from the resources. Typically, this is done using the search parameters described below. Given that documents may have other documents that replace or append them, clients should always check these relationships when accessing documents

### Generating a Document Reference

A client can ask a server to generate a document reference from a document. The server reads the existing document and generates a matching DocumentReference resource, or returns one it has previously generated. Servers may be able to return or generate document references for the following types of content:

|  |  |
| --- | --- |
| **Type** | **Comments** |
| [FHIR Documents](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\documents.html) | The uri refers to an existing Document |
| CDA Document | The uri is a reference to a [Binary](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\compartments.html#Binary) end-point that returns either a CDA document, or some kind of CDA Package that the server knows how to process (e.g. an IHE .zip) |
| Other | The server can be asked to generate a document reference for other kinds of documents. For some of these documents (e.g. PDF documents) a server could only provide a DocumentReference it is already existed, or the server had special knowledge of the document |

The server either returns a search result containing a single DocumentReference, or it returns an error. If some the URI refers to another server, it is at the discretion of the server whether to retrieve it or return an error.

The operation is initiated by a named query, using \_query=generate on the /DocumentReference end point:

GET [service-url]/DocumentReference/?\_query=generate&uri=:url&...

The "uri" parameter is a relative or absolute reference to one of the document types described above. Other parameters may be supplied:

|  |  |
| --- | --- |
| **Name** | **Meaning** |
| persist | Whether to store the document at the document end-point (/Document) or not once it is generated. Value = true or false (default is for the server to decide) |

# source\documentreference\xds-introduction.xml

### Scope and Usage

The XDS profile describes in detail how the [DocumentReference](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\documentreference.html) and [DocumentManifest](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\documentmanifest.html) resources are used in the context of XDS. The two resources may be used as a facade to an existing XDS server, such as is used for the [IHE MHD](http://wiki.ihe.net/index.php?title=Mobile_access_to_Health_Documents_(MHD)) specification, or it can be used the other way around, where the XDS functionality is implemented using a FHIR based server as the storage mechanism.

### Background and Context

The FHIR DocumentReference and DocumentManifest is based on the functionality defined by XDS, but they differ from XDS in some significant ways:

* SubmissionSet = DocumentManifest, and DocumentEntry = DocumentReference. These renamings are appropriate in the wider context of how these resources are used in FHIR.
* There is no direct association between a transaction and a DocumentManifest in FHIR, however a [transaction](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\http.html#transaction) may be used to ensure consistent commits
* Patient, Author and Authenticator are represented using standard [Patient](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\patient.html) and [Practitioner](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\practitioner.html) resources.
* The functionality expressed through the XDSFolder resource is implemented using the [List](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\list.html) resource, or by [tags](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\resource.html#tags)
* Some XDS specific fields that are not generally applicable do not have matching elements in the DocumentReference resource, and are implemented as FHIR extensions

#### Mapping Notes

The formal mappings are found below, but this section provides some additional description to help understand the relationships between the XDS tranasction and the FHIR resources.

|  |  |
| --- | --- |
| Patient | The following attributes of patient are all found in the [Patient](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\patient.html) resource:   * **patientId**: Patient.identifier. The patientId has a use of "official" * **sourcePatientId**: Patient.identifier. The sourcePatientId has a use of "usual" * **PatientInfo**: Various properties as appropriate in the Patient resource |
| Author | The following attributes of author are all found in the [Practitioner](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\practitioner.html) resource:   * **authorInstitution**: Practitioner.organization (and possibly Organization.identifier and Organization.name in a target Organization resource) * **authorPerson**: Practitioner.identifier and Practitioner.name * **authorRole**: Practitioner.role * **authorSpecialty**: Practitioner.specialty * **authorTelecommunication**: Practitioner.telecom |
| LegalAuthenticator | In XDS, policy is that there is a "legal authenticator", and this is represented in the DocumentReference.authenticator element (it has a more general meaning so it's not so restrictive outside the XDS use case) |
| Identifiers | The different identifiers go in different places, depending on the nature of the identifier:   * **entryUUID**: [Logical Id](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\resource.html#metadata) of the DocumentReference/DocumentManifest resource * **uniqueId**: DocumentReference.masterIdentier - the identifier of the document itself * **homeCommunityId & repositoryUniqueId**: These data items are not needed in a FHIR context because the document reference is directly available. If it's still needed for XDS service calls, use a service parameter by the name same name. Where the homeCommunityId is needed in a manifest, an [extension](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\extensibility.html) is defined (http://hl7.org/fhir/StructureDefinition/xdshomeCommunityId, which contains a [uri](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\datatypes.html#uri)) |
| Availability Status | Approved (available for patient care): DocumentReference/Manifest.status = current  Deprecated (obsolete): DocumentReference/Manifest.status = superseded |
| Comments | The information that currently is found in the comments slot is placed in the equivalent resource narrative (for human consumption). |
| Folders | There is no direct equivalent between to XDS folders in FHIR. Workflow associated with a document reference may be managed using [Tags](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\resource.html#tags), or documents can be explicitly grouped using the [List resource](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\list.html) |

#### Handling Updates

The [RESTful API](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\http.html) allows updates to the DocumentReference/DocumentManifest resources that the document repository is built on.

In the context of XDS, servers SHALL ensure that the masterIdentifier element of a DocumentReference is never changed after the resource is created. When a new document is created, a new DocumentReference SHALL be created. The server SHOULD ensure that the supersedes element is correctly populated, along with the status of any existing documents that are being superseded. It MAY choose to do this by requiring the clients to perform this operation, or simply performing the operation itself.

When used with XDS, updates to the document reference resource are only performed to correct the details associated with the document description - other identifiers, context, location etc. The document itself, the hash value, etc, SHOULD never change. Servers MAY choose to maintain the repository of resources so that there is only one DocumentReference for each original document (unique masterIdentifiers), but doing so will require some way of resolving conflicting claims around the document metadata from different submitters.

In order to implement the XDS profile, a server SHALL keep a full version history of DocumentReference, DocumentManifest, Patient, and Practitioner resources. This allows for Audit investigations, and also replication using stnadard pub/sub arrangements.

# source\documentreference\xds-notes.xml

# source\conceptmap\conceptmap-examples-header.xml

# source\conceptmap\conceptmap-introduction.xml

## Scope and Usage

A concept map defines a mapping from a concept defined in [one system](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\terminologies.html) to one or more concepts defined in other systems. Mappings are one way - from the source to the destination. In many cases, the reverse mappings are valid, but this cannot be assumed to be the case.

Mappings between code systems are only defined in the context of the specified source and destination [value sets](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\valueset.html) - they are specific to a particular context of use. The mappings may be useful in other contexts, but this must be determined based on the context of use and meaning; it cannot be taken for granted automatically. Note that all code systems have value sets that include the entire code system, and these value sets can be used for mappings that are valid in all contexts.

Each mapping for a concept from source to target includes an [[equivalence](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\valueset-concept-map-equivalence.html)] property that specifies how similar the mapping is (or, in some cases, that there is no valid mapping). There is one element for each concept or field in the source that needs to be mapped. Each source concept may have multiple targets:

* because there are multiple possible mappings (e.g. ambiguous)
* to specify a correct map, and specify other mappings as invalid
* when there are multiple mappings depending on the values of other elements (dependsOn)

There SHOULD be at least one target for each element, but some incomplete concept maps may not have a target for each concept.

## Background and Context

Further discussion of the issues involved in mapping between concept definition systems can be found in the [HL7 v3 Core Principles](http://www.hl7.org/documentcenter/public/standards/V3/core_principles/infrastructure/coreprinciples/v3modelcoreprinciples.html) document and the functionality described in the [OMG CTS 2](http://www.omg.org/spec/CTS2/1.0/) specification.

# source\conceptmap\conceptmap-notes.xml

## Notes

* The value of the *system* and *code* element are the same as used by the [Coding](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\datatypes.html#Coding) data type
* When a mapping equivalence is characterized as "narrower", some explanation of the scope difference SHALL be provided in the comments
* The concept map is a statement of mapping in a single direction. The existence of a matching mapping in the reverse direction cannot be assumed to exist automatically, but only through human review

# source\valueset\valueset-examples-header.xml

As well as the specific example below, there are many value sets published as part of defining other resources. See:

* [FHIR Valuesets](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\terminologies-valuesets.html)
* [V2 Tables](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\terminologies-v2.html)
* [V3 Code systems and Value sets](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\terminologies-v3.html)

# source\valueset\valueset-introduction.xml

## Scope and Usage

The FHIR terminology specification is based two key concepts, originally defined in [HL7 v3 Core Principles](http://www.hl7.org/documentcenter/public/standards/V3/core_principles/infrastructure/coreprinciples/v3modelcoreprinciples.html):

* **code system** - defines a set of codes with meanings (also known as enumeration, terminology, classification, and/or ontology)
* **value set** - selects a set of codes from those defined by one or more code systems

Code systems define which codes (symbols and/or expressions) exist, and how they are understood. Value Sets select a set of codes from code systems to specify which codes can be used in a particular context.

Value sets may be constructed in one of two ways:

* A value set can contain an in-line *codeSystem*, and/or
* A value set can be *composed* of codes defined in other code systems, either by listing the codes or by providing a set of selection criteria

A value set can also be "expanded", where the value set is turned into a simple collection of enumerated codes. This operation is performed to produce a collection of codes that are ready to use for data entry or validation. An expanded value set may also contain the original definition as well.

Value sets that contain inline code systems are intended for small, simple code systems that are found throughout the implementation context (e.g. lists of wards, status codes, enumerations). The inline code system definition is not intended to represent large publically defined terminologies such as LOINC etc - these have their own distribution formats .

## Boundaries and Relationships

* Value sets are used in [StructureDefinitions](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\structuredefinition.html), and [Questionnaires](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\questionnaire.html) to specify the allowable contents for coded elements
* In addition, a specific [Coding](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\datatypes.html#Coding) can reference the value set it was picked from
* [Concept Maps](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\conceptmap.html) describe mappings between value sets
* The ValueSet resource design is based on the functionality described in the [OMG CTS 2](http://www.omg.org/spec/CTS2/1.0/) specification, along with metadata in the HL7 Value Set Definition specification. Value set resources can be converted to CTS2 value set and code system resources
* The value set resource is aligned with the [Value Set Definition](http://wiki.hl7.org/index.php?title=Value_Set_Definition_Standard_Project) (VSD) project. Not all the elements defined by the VSD are part of the base resource - some are defined as part of the [ValueSet Extensions](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\valueset-extensions.html). In the ValueSet resource, the lockedDate, compose and codeSystem elements make up the VSD Content Logical definition

## Background and Context

When using value sets, proper differentiation between a code system and a value set is important. This is one very common area where significant clinical safety risks occur in practice. Implementers should be familiar with the content in [Using Codes in resources](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\terminologies.html).

Each value set has 2 different URLs that can be used to reference it, its logical identifier, and its location.

The location of the value set is a URL by which it may be retrieved, usually from a FHIR server, and is often a relative reference to a value set on the same server. The logical identifier is in the value set itself, in [ValueSet.url](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\valueset-definitions.html#ValueSet.url). This is the logical identity (sometimes called the canonical URL) that refers to this value set across all systems. Ideally, the URL should also be the location of the master version of the value set, though this is not always possible.

For example, the value sets published as part of FHIR all have a logical URL which is also a location by which they may be accessed in the FHIR specification itself. However, while a new version of the FHIR Specification is being prepared, value sets that are published in the drafts will not be found in the current FHIR specification.

Because it is common practice to copy (cache) value sets locally, most references to value sets can either be logical or literal URL.

### ValueSet Identification

A value set has 3 identifiers:

* ValueSet.id: the local identifier on the system that holds it - this changes as it moves from server to server (this, the the server address prepended, is called the 'literal identity' of the resource)
* ValueSet.url: the master identifier that never changes for this value set - the same in every copy (this is called the 'logical identity' of the resource)
* ValueSet.identifier: A system/value pair that is used to identify the value set in other contexts (such as an OID in an HL7 V3 specification)

For further information, see [Resource Identity](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\resource.html#id).

# source\valueset\valueset-notes.xml

## Identifier and Version

The *identifier* and *version* elements may be used to reference this value set in a design, a profile, a CDA template or V3 message (valueSet and valueSetVersion). These different contexts may make additional restrictions on the possible values of these elements. These elements are generally not needed when using value sets with FHIR implementations as they can make use of the innate identifier and versioning mechanism associated with the resource

## Value Sets with In-line Code Systems

A value set that contains an inline code system automatically includes all the codes in that the code system defines. This is useful for simple sets of codes that are highly specific and context-dependent. The value set and the code system are both given URI identifiers by which they may be identified from elsewhere (ValueSet.identifier and ValueSet.codeSystem.system). These identifiers SHALL be different.

* *ValueSet.codeSystem.system* is the URI that identifies these codes when used in a [Coding](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\datatypes.html#Coding)
* The usability of the codes is closely linked to the quality of the definitions. Although a definition is not required for each concept, a good definition SHOULD be provided. In the absence of any definition, there is no formal meaning associated with the concept
* This specification does not fix the meaning of the relationship between parent and child codes, Most code systems use a subsumption based approach, but other kinds of relationships are possible, including partitive and categorization relationships. The definitions of the concepts dictate the nature of the relationship
* An abstract concept SHALL have contained concepts
* The code system SHALL NOT contain duplicate codes

Note: Value sets only contain inline code systems when they are not defined elsewhere, such as in SNOMED CT, LOINC, RxNorm etc which have their own public distributions. To specify a value set that is made up of codes from other code systems, see "compose" below.

### Versioning Code Systems

Most code systems evolve over time, due to corrections, clarifications, and changes to approach or underlying knowledge or reality. If these changes lead to the meanings of existing codes changing significantly, then the interpretation of the code system becomes version dependent. This significantly complicates implementation based on the code system, to the point where it is not clear that safety can be assured, so SHOULD be avoided whenever possible. It is preferable to assign a new identifier to a code system when any concepts in it have a significant change in meaning (for example, the German diagnostic classification code system ICD10GM2009 has a different *system* to ICD10GM2008), but this also can have substantial impact on implementation, so is often not practical - for instance, [SNOMED CT](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\snomedct.html) has a complex version release framework, which may lead to variations in meaning of concepts, but there is only one identifier for LOINC.

For this reason, a code system MAY provide a version identifer in *ValueSet.codeSystem.version*. The version specific identifier SHOULD be provided whenever there are potentially significant changes in meaning across multiple releases of a code system. There is no particular format requirement for the version identifier, though HL7 recommends a date based approach.

When the value set definition of a code system includes a version identifier, the version identifier SHOULD be used in [Coding](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\datatypes.html#coding) instances that refer to the code system.

Where the terminology does not clearly define what string should be used to identify code system versions, the recommendation is to use the date (expressed in FHIR date format) on which that version was officially published as the version date.

## Value Sets that include codes defined elsewhere

Value sets that include codes defined in some other code system are most useful when dealing with large general code systems such as SNOMED CT, LOINC, RxNorm or various IETF code sets including human language. The value set can be a simple list of included codes or it can be some kind of general selection criteria using the facilities provided by the code system.

* Within an include or exclude criterion, multiple filters and concept selections are intersected. All the conditions specified SHALL be true.
* An include statement consists of any enumerated codes and any codes that meet the filter criteria
* If the system reference is not version specific and filters are present, then the contents of the value set are open and change over time as the underlying code systems are updated
* The content of the value set is constructed by unioning of all the import and include statements and then eliminating any of the 'excluded' codes.
* A value set needs to do something. It can't simply include an existing value set without also including additional content or excluding content
* Using the property filters is only possible where the underlying code system defines appropriate properties. Note that in some cases, the underlying code system defines the logical concepts but not the syntax for exercising them. In such cases, the literal definitions may be provided by a third party. See below for notes about its use against common code systems
* Value sets may include abstract codes - that is, codes designated by the underlying code system as not for use as a real concept. These abstract codes are typically used as a grouping/searching mechanism, and can be included either by enumerating them, or by using a filter

When a value set enumerates codes, it is also able to define an alternative display for the code that is to be used where ever the value set is expanded and used in a UI. This facility is provided to cover the following circumstances:

* The system that defines the code or expression doesn't provide a display for this code (or any codes)
* The system that defines the code or expression defines multiple choices for display
* The system provides a very long display name that is unnecessary or inappropriate in the context of this value set (e.g. a display name of "Glucose [Mass/volume] in Serum or Plasma --10 PM specimen" for LOINC code 48991-4, when the value set only includes Glucose mass/vol in serum/plasma codes). As the display names get longer, this becomes more important

Note that care must be taken in order to avoid "changing the meaning" of the concept by implying that it means something other than the explicit definition of the concept in the underlying system (e.g. in the case above, using a display "Glucose Concentration at 10pm"). For this reason, some contexts of use do not allow a display to be associated with a specific code.

The display name for the code in the value set is only used in the UI. The display in a a [Coding](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\datatypes.html#Coding) must be taken from the underlying system, even if a value set is referenced explicitly in the Coding. The alternative display specified in the value set would go in [CodeableConcept](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\datatypes.html#CodeableConcept).text.

## Value Sets with multiple code systems

Value sets may select codes from multiple code systems - either by including codes from different systems, importing to other value sets that do, and/or containing their own code system.

Note that a value set always includes any codes in an inline code system, even if it also has a compose. A typical use for containing both a compose statement and an inline code system is when including a set of codes from elsewhere, and adding a few additional codes to cover cases not catered to by the included codes.

Best Practice Note: mixing definitional systems offers the potential for confusing, overlapping, and inconsistent definitions. Creating value sets that cross code systems should be done with care to avoid creating definitional confusion.

### Code systems Note

How filters are used with various code systems:

* [Using LOINC with FHIR](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\loinc.html)
* [Using SNOMED CT with FHIR](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\snomedct.html)
* [Using RxNorm with FHIR](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\rxnorm.html)
* [Using UCUM with FHIR](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\ucum.html)
* [Using NCI Metathesaurus with FHIR](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\ncimeta.html)
* [Using CPT with FHIR](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\cpt.html)
* [Using NDF-RT with FHIR](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\ndfrt.html)
* [Using UNII with FHIR](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\unii.html)
* [Using NDC with FHIR](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\ndc.html)
* [Using CVX with FHIR](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\cvx.html)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **System** | **Property Name** | **Operation** | **Value** | **Definition** | **Example** |
| V3 Code systems | concept | is-a | [code] | Includes all codes that have a transitive is-a relationship with the concept identified by the value | [Relationship Type](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\valueset-relatedperson-relationshiptype.html) |
| V2 Tables |  |  |  | (no filters defined) |  |

## Value Set Expansion

A value set can be "expanded", where the definition of the value set is used to create a simple collection of codes suitable for use for data entry or validation. This is most useful when a value set includes all the codes in a code system, or a set of codes by filter.

A resource that represents a value set expansion includes the same identification details as the definition of the value set, and MAY include the definition of the value set (*codeSystem* and *compose* elements). In addition it has a *expansion* element which contains the list of codes that constitute the value set expansion. If the expansion has nested contains elements, there is no implication about the logical relationship between them, and the structure cannot be used for logical inferencing. The structure exists to provide navigational assistance for helping human users to locate codes in the expansion.

When a request for an expansion is received (e.g. for the [$expand](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\valueset-operations.html#expand) operation, the following process should be followed:

* If the value set already has an expansion (e.g. a stored expansion), simply take the existing expansion as it is. If not, then:
* for each *compose.import*, find the referenced value set by ValueSet.url, expand that (e.g. using the [$expand](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\valueset-operations.html#expand) operation: GET [base]/ValueSet/$expand$identifier=[compose.import]), and add it to the result set. This means that expansion across imports is a recursive process
* for each *compose.include*, identify the correct version of the code system, and then:
  + if there are no codes or filters, add every code in the code system to the result set
  + if codes are listed, check that they are valid, and check their active status, and if ok, add them to the result set (the profile parameter to the $expand operation may be used to control whether active codes are included)
  + if any filters are present, process them in order (as explained above), and add the intersection of their results to the result set
* for each *compose.exclude*, follow the same process as for *compose.include*, but remove any codes from the result set, instead of adding them
* add any codes in the *codeSystem* to the result set

The "result set" is then represented in *expansion*. Note that the expansion structure is inherently ordered, and also provides support for a hierarchical tree of items. This specification does not fix the meaning of use of either of these, and the conceptual approach described should not be understood to prohibit any implementation approach in these regards. There is a [defined operation](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\valueset-operations.html) to ask a server to perform this expansion.

An expansion may include entries in the expansion that only serve an arbitrary grouping purpose, to make it easier for a human to use the list. These entries have no system or code, and must be marked as abstract. Note that the value set codeSystem and compose offer no support for defining these, but this does not exclude servers from using extensions or other knowledge to introduce such groups as an implementation feature.

The codes in the expansion should be treated as case sensitive - implementers should use the correct case. Implementers can consult the definition of the code system to determine whether the code system that defines the code is case sensitive or not.

Whether to store expanded value sets, or simply to store their definitions, and expand on the fly is a matter for system deployment. Some servers, including public value sets servers, only store expansions. However any system that stores an expansion must be concerned with how to determine whether the expansion is still current, and this requires deep knowledge of how the expansion was created. A system with a dedicated terminology server that returns expansions on demand avoids this problem, but leaves open the question of how to audit the specific expansion that was used for a particular case. One solution to this is to use a dedicated terminology server, and have the clients ask for expansions on demand based on the value set definitions, and for the server to store (and reuse as appropriate) the returned expansion (when it reuses the expansion, ValueSet.expansion.identifier will be the same).

### Code systems with detailed metadata

Sometimes code systems may be used to represent more complex information than just code, display name and code system. For example, a code system of drug information which contains information about the content of the medication (e.g. RxNorm), or a set of observation types, that contain methods, units, etc (e.g. LOINC). In FHIR, these are handled by splitting the concept into two distinct parts - the **ValueSet** resource is used to manage the codes, display names and relationships. A separate "detail" resource (e.g. [Medication](C:\\Users\\Lloyd\\Documents\\SVN\\FHIR\\build\\qa\\medication.html) for drugs, [DataElement](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\dataelement.html) for observation types, [Location](file:///C:\Users\Lloyd\Documents\SVN\FHIR\build\qa\location.html) for location, etc.) is used to convey detailed information (dose form & strength, allowed data type or permitted values, address & hours of operation, etc.) One "detail" resource instance is created for each code.

This division accomplishes several things:

* It allows generic systems that support terminology management to perform standard terminology operations on code systems dealing with complex structures - code lookup, validation, subsumption testing, mapping and translation.
* It allows information to be exchanged about individual medications, data elements and locations. Codes can't be retrieved individually in FHIR - it is necessary to retrieve the entire resource. By packaging the detailed information in separate resources, independent retrieval and update is possible.
* It supports use-cases for sharing medication, location, observation type and similar information in circumstances where the code may be unknown, unavailable or occasionally non-existent (e.g. custom compounds, non-registered locations). Having a distinct resource supports these capabilties which would not be possible using **ValueSet**.

Note that this division in FHIR does not imply that a similar division is required in the internal representation used by systems exposing a FHIR interface. Similarly, some systems may choose to only expose or maintain one aspect of such information types (i.e. only the discrete resource instances or only the value set.)

The linkage between the "detail" resource and the **ValueSet** is accomplished via the code element (or equivalent) on the detail resource. As well, the "name" or "title" on the detail resource generally corresponds with the display name on the matching code. Most detail resources will also have an "identifier" element. This *can* be set to the same value and namespace as the code, but if the only identifier a resource has is its defining code, it may be better to omit the identifier entirely.